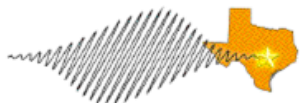


# The Texas Petawatt Laser User Program

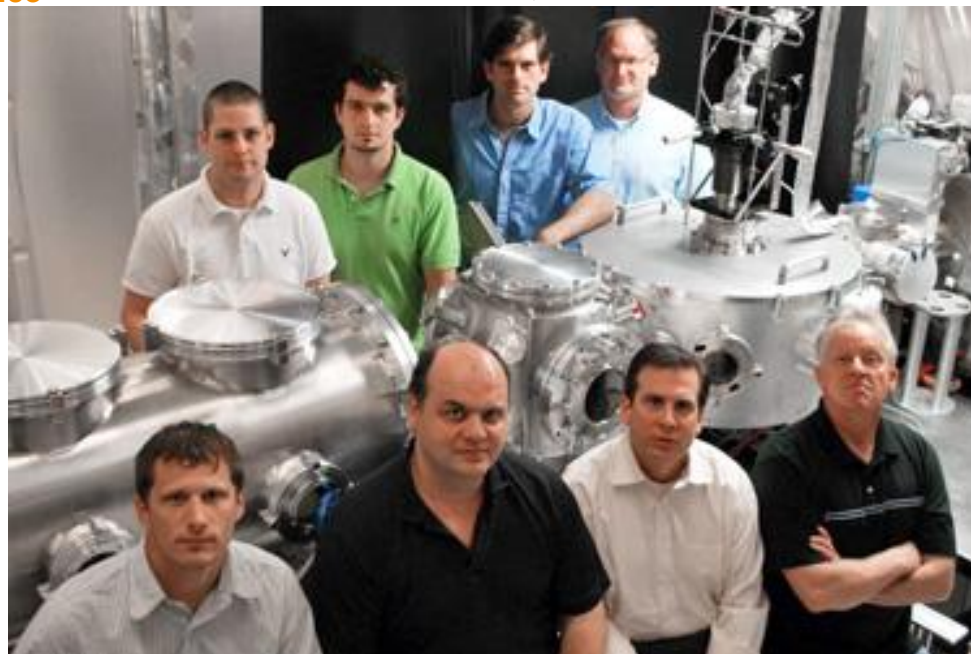
Texas Center for



High Intensity Laser Science

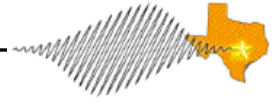
Presented By  
**Mike Donovan**

Associate Director, Texas Petawatt

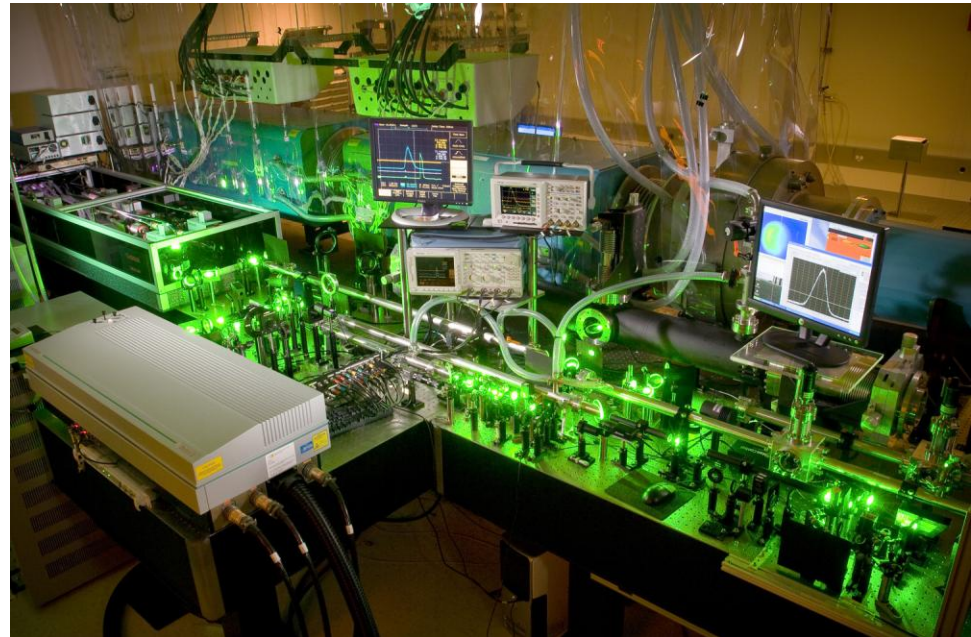


User Program Website  
<http://texaspetawatt.ph.utexas.edu/>

# Presentation Agenda



- A word about the UT Center for HED Science
- A description of the Texas Petawatt Laser User Program
  - Laser capabilities
  - User SOP
  - Requesting time
  - Science program
  - Schedule
  - Future efforts

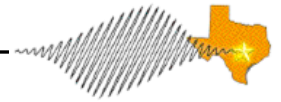


The OPCPA chain of amplification

**Our User Website is the best source for information**  
**<http://texaspetawatt.ph.utexas.edu/>**

# The UT Center for HED Science (CHEDS) is an NNSA SSAA Center of Excellence

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## People

- Four professors (primarily UT supported)
- Three Associate Directors (two primarily UT supported)
- Four staff scientists (including one of the Associate Directors)
- Three post-docs
- Eight other staff (TPW laser and administrative)
- Twelve graduate students
- Somewhere around 8 FTE undergraduates (more in the summer)
- And a partridge in a pear tree.....

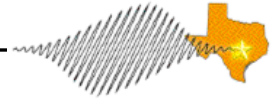
## Big Lasers

- GHOST—1.6 J, 115 fs baby Texas Petawatt (OPCPA/glass hybrid)
- THOR—Ti:Sapphire, 10 Hz, 700 mJ, 35 fs being upgraded to petawatt
- Texas Petawatt Laser (TPW)—190 J, 170 fs, f/3 and f/40 target chambers

**If interested in collaboration on GHOST or THOR,  
see Dr. Aaron Bernstein (informal process)**

# Every experiment at the Texas Petawatt is governed by our User Program

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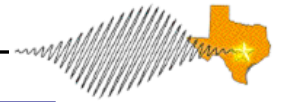
- Experiments are selected and scheduled by the Petawatt Oversight Committee
- The Texas Petawatt Laser staff is focused on laser performance, operational efficiency, scientific achievement, and user support
- There are three reviews leading up to an experiment
- We are set up to assist users in preparing experiments

**Most of our users are members of the Center for HED Science, but we actively seek external users/collaborators**

**As an NNSA Center, we grow the next generation of HED scientists, support NNSA lab programs, support appropriate NNSA scientific goals, and support other universities doing the same**

**The Texas Petawatt Laser is open for business**

# The Texas Petawatt Laser is the currently the world's highest peak-power laser

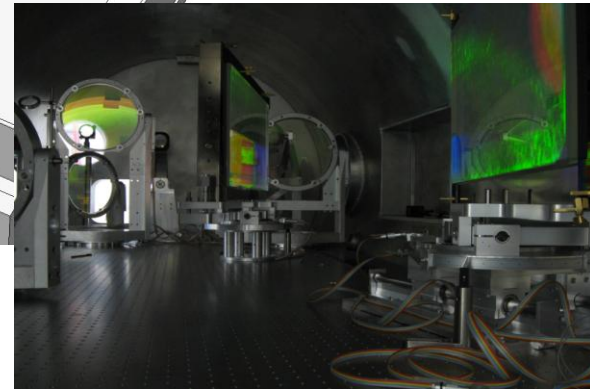
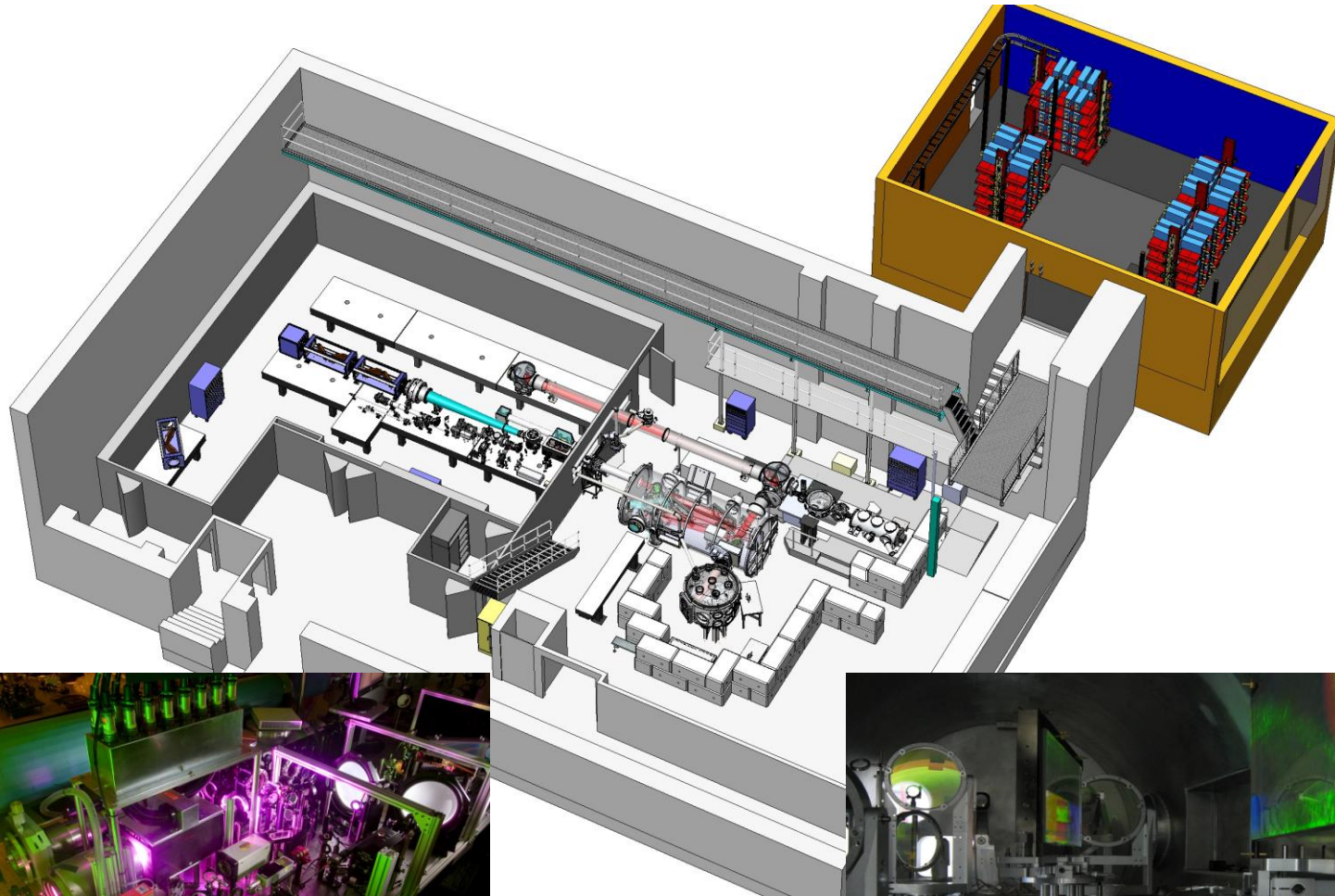
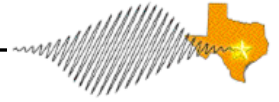


	CW	OPA	Rod Shots	System Shots
Rep Rate	CW	Single Shot to 2.5Hz	every 15 minutes	once an hour
Energy/Power on target	500mW	100mJ	7 J	Up to 190 J
Spot Size at TC1	5 $\mu$ m	5 $\mu$ m	5 $\mu$ m	5 $\mu$ m
Spot Size at TC2	100 $\mu$ m	100 $\mu$ m	100 $\mu$ m	100 $\mu$ m
Pulse Duration	N/A	135fs	170fs	170fs
Total number of shots per day	N/A	N/A	30	7

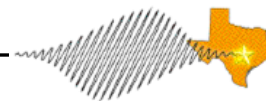
**The TPW User Program favors experiments that need our combination of energy and intensity**



# Doing experiments on the Texas Petawatt is a rewarding experience



# The Texas Petawatt Laser User SOP is the definitive reference (see website)

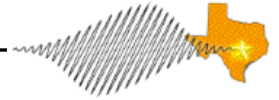


Paragraph No.	Paragraph Title	Page
1	Introduction and Scope	1
2	Contents	2
3	Requesting shot time on the TPW	2
4	Selection and scheduling of shot time on the TPW	3
5	TPW Governance and the Petawatt Oversight Committee (POC)	3
6	Principal Investigator, Experimental Team Leader, and TPW Staff Liaison Responsibilities	3
7	Meetings in preparation for TPW Experiments	4
8	User equipment from home station	5
9	UT hosting of TPW users	5
10	Training required for a TPW user	8
11	Operations of the TPW during experiments	9
12	Experimental data collection and management	10
13	Response to laser down time and experimental issues	10
Appx. A	Research opportunities on the TPW (As provided to the Omega Users Group)	12
Appx. B	Operating modes of the Texas Petawatt Laser	13
Appx. C	TPW Shot Request Format	15

**The most important information in the SOP is conveniently presented at the web site**

# It is easy to request time on the Texas Petawatt

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A researcher interested in conducting an experiment on the Texas Petawatt Laser should contact one of the following three points of contact:

- Dr. Mike Donovan  
[mdonovan@physics.utexas.edu](mailto:mdonovan@physics.utexas.edu) (512) 475-7956
- Mr. Mikael Martinez  
[mikaelm@physics.utexas.edu](mailto:mikaelm@physics.utexas.edu) (512) 471-5648
- Prof. Todd Ditmire  
[tditmire@physics.utexas.edu](mailto:tditmire@physics.utexas.edu) (512) 471-3296

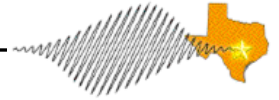
Experiments are generally collaborations with UT to some degree, and typically last 3-4 weeks

There is a 4-6 page proposal that goes to the Petawatt Oversight Committee

**We expect to typically host 2-3 outside experiments out of 10-12 experiments per year**



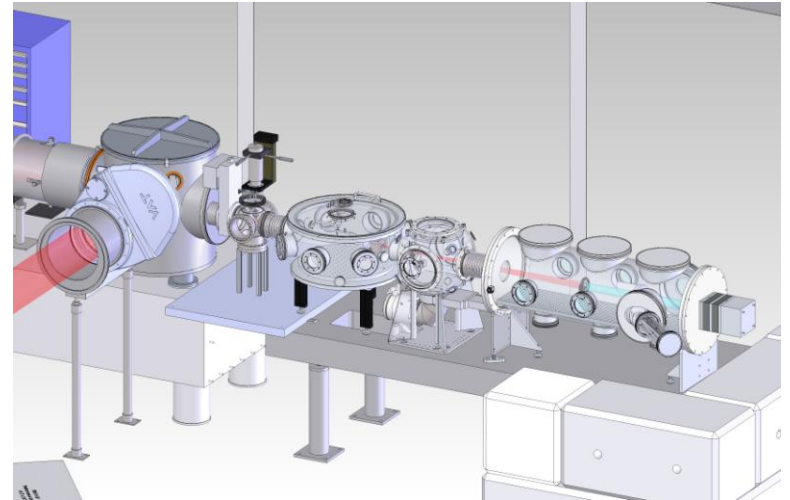
# Our science strategy has three thrusts



We are currently emphasizing these thrust areas:

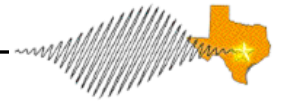
- Proton acceleration and proton beam isochoric heating of dense plasmas (led by Prof. Todd Ditmire)
- Wakefield electron acceleration above a GeV (led by Prof. Mike Downer)
- Fusion neutron generation in pulsed magnetic fields (led by Prof. Roger Bengtson in collaboration with Sandia National Laboratories)

However, our experimental program is not limited to our thrust areas



**If you have an idea for an experiment, talk to us about it**

# We schedule seven to twelve months in advance



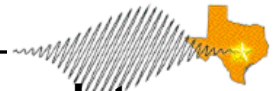
The Petawatt Oversight Committee meets in June, September, December, and March to select and schedule experiments

Investigator	Subject	Start	End
W.S. Bang	Cluster Fusion	7/18/11	8/19/11
M. Downer	Laser Wakefield Acceleration	8/29/11	9/16/11
J. Keto	High Harmonic Generation	9/26/11	10/14/11
M. Storm (OSU)	Proton Acceleration from Secondary Lithium Targets	10/24/11	11/11/11
G. Dyer	Warm Dense Matter—Proton Isochoric Heating	11/28/11	12/22/11
M. Downer	Laser Wakefield Acceleration	1/9/12	2/10/12
K. Flippo (LANL)	Advanced Target Normal Sheath Acceleration	2/20/12	3/16/12
E. Gaul	Magnetic Vortex Acceleration	3/26/12	4/13/12
R. Jafer	Proton acceleration with Microdot Targets	4/23/12	5/11/12
R. Bengtson	Magnetically Confined Fusion	5/28/12	6/22/12

**We typically have one week for laser maintenance, laser upgrades, and experimental preparation**

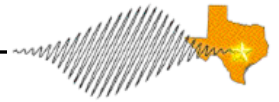
# **We continue to work to become the best facility possible**

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- Instituted an internal website and an electronic laboratory notebook to improve team performance, laser performance, and efficiency
- Collecting and analyzing data to characterize the quality and variability of laser pulses to enhance user planning
- Using encircled energy graphs (energy enclosed versus radius from centroid) to better understand “pulse quality”
- Improving on the use of the deformable mirror for better pulse profiles
- Improving pre-pulse measurement capability
- Installing probe pulse lines in both target chambers
- Upgrading the off-axis parabolic final focusing mirror to increase damage threshold (thanks to Los Alamos National Lab)
- Working to provide post-shot laser data as quickly, completely, and accurately as possible
- Improved our laser diagnostic package
- Improving our system of experimental data management and distribution

**As we gain laser operating experience, we are improving laser performance and operations**



# The Texas Petawatt Laser is awesome. Questions?

