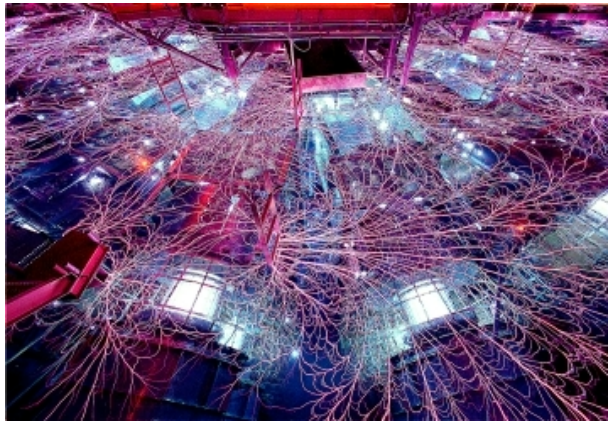
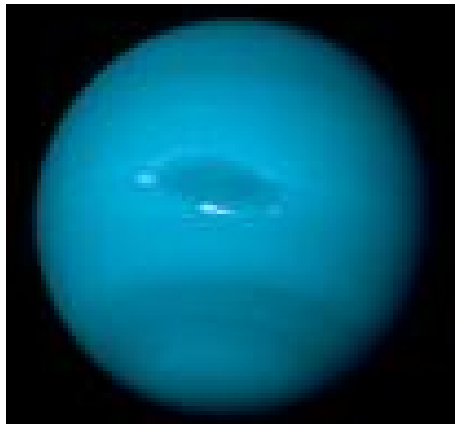
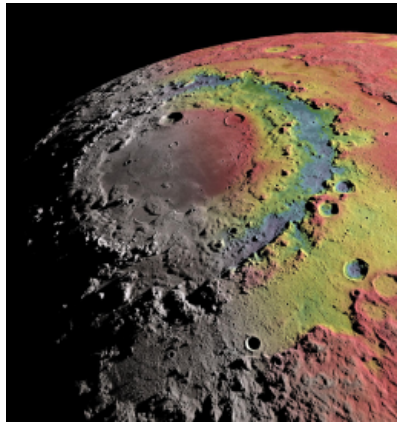
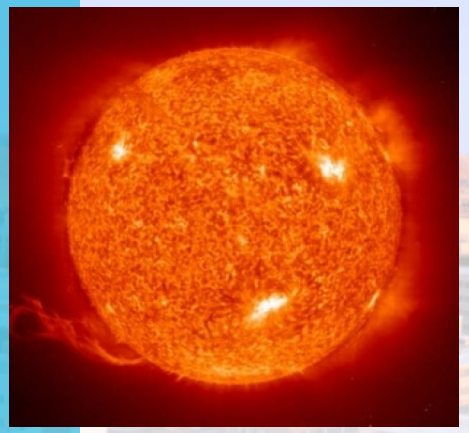
SAND2022-XXXXC

2022 ZFS Workshop









PRESENTED BY

Marcus D Knudson

Z Fundamental Science Workshop
2-5 August 2022

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc. for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Agenda for Wednesday, August 3rd

8:30 – 12:00 Plenary session opening remarks, Z Facility status, and program reviews: Barcelona

- 8:30 – 9:00 Dan Sinars, Sandia
  Welcome and introduction
- 9:00 – 9:30 Chris Bourdon, Sandia
  Z Machine update
- 9:30 – 10:00 Michael Jones / Eric Harding, Sandia
  Diagnostic update
- 10:00 – 10:30 Break
- 10:30 – 11:00 Dan Mayes, University of Texas
  Laboratory tests of stellar interior opacity models
- 11:00 – 11:30 Georges Jaar, University of Nevada
  Radiation heating and cooling, and the thermal stability of x-ray photoionized plasmas
- 11:30 – 12:00 Bart Dunlap, University of Texas
  Atomic processes in white dwarf atmospheres in the laboratory

12:00 – 1:15 Lunch

12:00 – 1:15 Lunch Break
2nd Floor Mezzanine

Reminder: Sandians cannot partake in lunches

Agenda for Wednesday, August 3rd

1:15 – 3:45 Plenary session program reviews: Barcelona

- 1:15 – 2:00 Patty Cho, University of Texas / Guillaume Loisel, Sandia
  Testing high-density and transient effects in photoionized plasma emission from black hole accretion
- 2:00 – 3:00 Jack Hare, Massachusetts Institute of Technology
  MARZ: Magnetically ablated reconnection on Z
- 3:00 – 3:15 Break
- 3:15 – 3:45 Ivan Oleynik, University of South Florida
  Phase transitions in SiC in the interiors of carbon-rich planets

3:45 – 5:30 Break-out sessions: Barcelona, Majorca, Casablanca, Valencia

Break-out sessions begin at 3:45 pm

Break-out Session Room Assignments

Laboratory astrophysics	Patty Cho, Don Winget, Jim Bailey	Barcelona
Planetary physics / Materials	Sakun Duwal, Chad McCoy, Josh Townsend	Majorca
Theory / Modeling / Computation	Andy Porwitzky	Valencia
Magnetized HED / Z-pinch	Daniel Ruiz, Kathy Chandler, Matt Gomez	Casablanca

Break-out session agendas can be downloaded from the Workshop website

https://www.sandia.gov/pulsed-power/workshop-2022/

Agenda for Thursday, August 4th

8:30 – 10:30 Plenary session program reviews: Barcelona

- 8:30 – 9:00 Stein Jacobsen, Harvard University
  Formation and evolution of Earth-like and Water-World planets
- 9:00 – 9:30 Alisha Clark, University of Colorado
  Origin of Earth's water: Role of hydrous melts at extreme P-T conditions
- 9:30 – 10:00 Steven Jacobsen, Northwestern University
  Origin of the ultra-low velocity zones atop Earth's core-mantle boundary
- 10:00 – 10:30 Yingwei Fei, Carnegie Institution for Science
  Shock compression of pre-synthesized dense high-pressure phases

10:30 – 12:00 Break-out sessions: Barcelona, Majorca, Casablanca, Valencia

12:00 – 1:15 Lunch

1:15 – 4:00 Break-out sessions: Barcelona, Majorca, Casablanca, Valencia

4:00 – 4:30 Poster session setup

4:30 – 6:30 Student poster session

4:30 – 6:30 Poster Session

2nd Floor Mezzanine

Break-out Session Room Assignments

Laboratory astrophysics	Patty Cho, Don Winget, Jim Bailey	Barcelona
Planetary physics / Materials	Sakun Duwal, Chad McCoy, Josh Townsend	Majorca
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Break-out session agendas can be downloaded from the Workshop website

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Agenda for Friday, August 5th

8:30 – 9:30 Plenary session: Barcelona

- 8:30 – 9:30 Nick Hawker, First Light Fusion
  Plans for a new pulsed power machine at First Light Fusion

9:30 – 11:30 Break-out sessions: Barcelona, Majorca, Casablanca, Valencia

11:30 – 12:00 Plenary session closing remarks: Barcelona

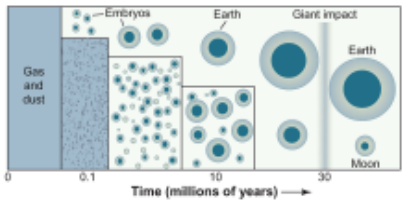
12:00 – 1:30 Lunch

The hotel will be handing out boxed lunches

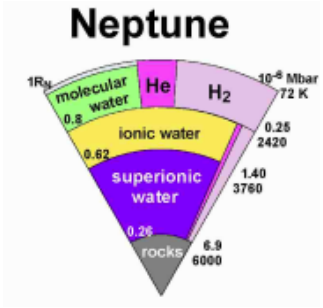
Break-out session room assignments:

Laboratory astrophysics	Patty Cho, Don Winget, Jim Bailey	Barcelona
Planetary physics / Materials	Sakun Duwal, Chad McCoy, Josh Townsend	Majorca
Theory / Modeling / Computation	Andy Porwitzky	Valencia
Magnetized HED / Z-pinch	Daniel Ruiz, Kathy Chandler, Matt Gomez	Casablanca

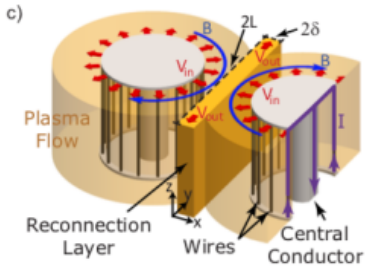
ZFundamental Science Program is a growing community



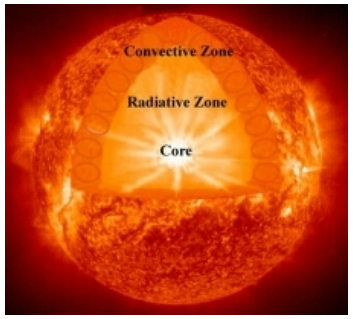
Earth and super earths



Giant Planets



Magnetic reconnection



Stellar physics

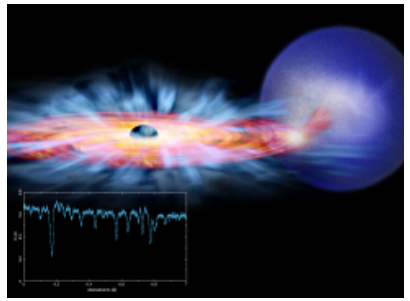
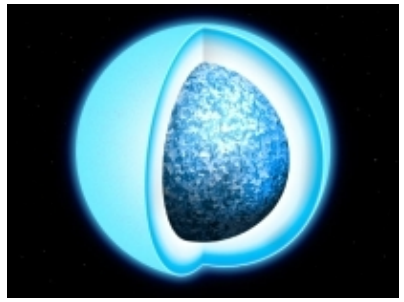


Photo-ionized plasmas



White dwarfs

Resources over 12 years

- 141 dedicated ZFSP shots (8.5% of all Z shots)
- Ride-along experiments on Z program shots, guns, DICE, and THOR

Science with far-reaching impact

- SCIENCE, Nature, Nature Geoscience, Nature Communications
- 7 Phys. Rev. Lett, 3+ Physics of Plasmas, 6+ Physical Review (A,B,E)
- More than 40 total peer reviewed publications and 10 conference proceedings
- 70+ invited presentations

Popular outreach

- National Public Radio, “All things considered”, 2014
- Discover Magazine
  - Reportage 9/16/2012
  - *Iron rain #62 in top 100 Science stories in 2015*
- Albuquerque Journal Front Page 9/2017
- Twice local TV coverage on planetary science

3 teams awarded shots from the CY20 Call for Proposals

shots: CY21 / CY22 / CY23

Jacobsen et al. with Jean-Paul Davis and Sakun Duwal POCs New Team

- Origin of the ultra-low velocity zones atop Earth's core-mantle boundary: shock-ramp compression of iron-rich (Mg,Fe)O

4 shots: 1 / 2 / 1
actual: 0 / 2 / 2

Oleynik et al. with Patricia Kalita and Tom Ao POCs New Team

- Phase transitions in SiC in the interiors of carbon-rich exoplanets

4 shots: 1 / 2 / 1
actual: 0 / 2 / 2

Hare et al. with Kathy Chandler POC New Team

- MARZ: Magnetically Ablated Reconnection on Z

4 shots: 1 / 2 / 1
actual: 0 / 3 / 1

7 teams awarded shots from the CY21 Call for Proposals

Nagayama et al. with Jim Bailey POC (ZAPP lead)
- Laboratory tests of stellar interior opacity models

Cho et al. with Guillaume Loisel and Jim Bailey POCs
- Laboratory tests of photoionized plasma emission formation for accretion-powered objects

Dunlap et al. with Guillaume Loisel and Jim Bailey POCs
- Atomic processes in white dwarf atmospheres in the laboratory

Kuranz et al. with Taisuke Nagayama and Jim Bailey POCs
- Cosmologically relevant radiation-driven heat fronts (proof-of-concept)

Jaar et al. with Guillaume Loisel and Jim Bailey POCs
- Thermal stability of x-ray photoionized plasmas (proof-of-concept)

shots: CY22 / CY23 / CY24

ZAPP
Z Astrophysical Plasmas Project

6 shots: 0 / 3 / 3
actual: 0 / 4 / 3

Jacobsen et al. with Patricia Kalita POC
- Formation and evolution of Earth-like and Super-Earth planets

3 shots: 1 / 2 / 0
actual: 1 / 2 / 0

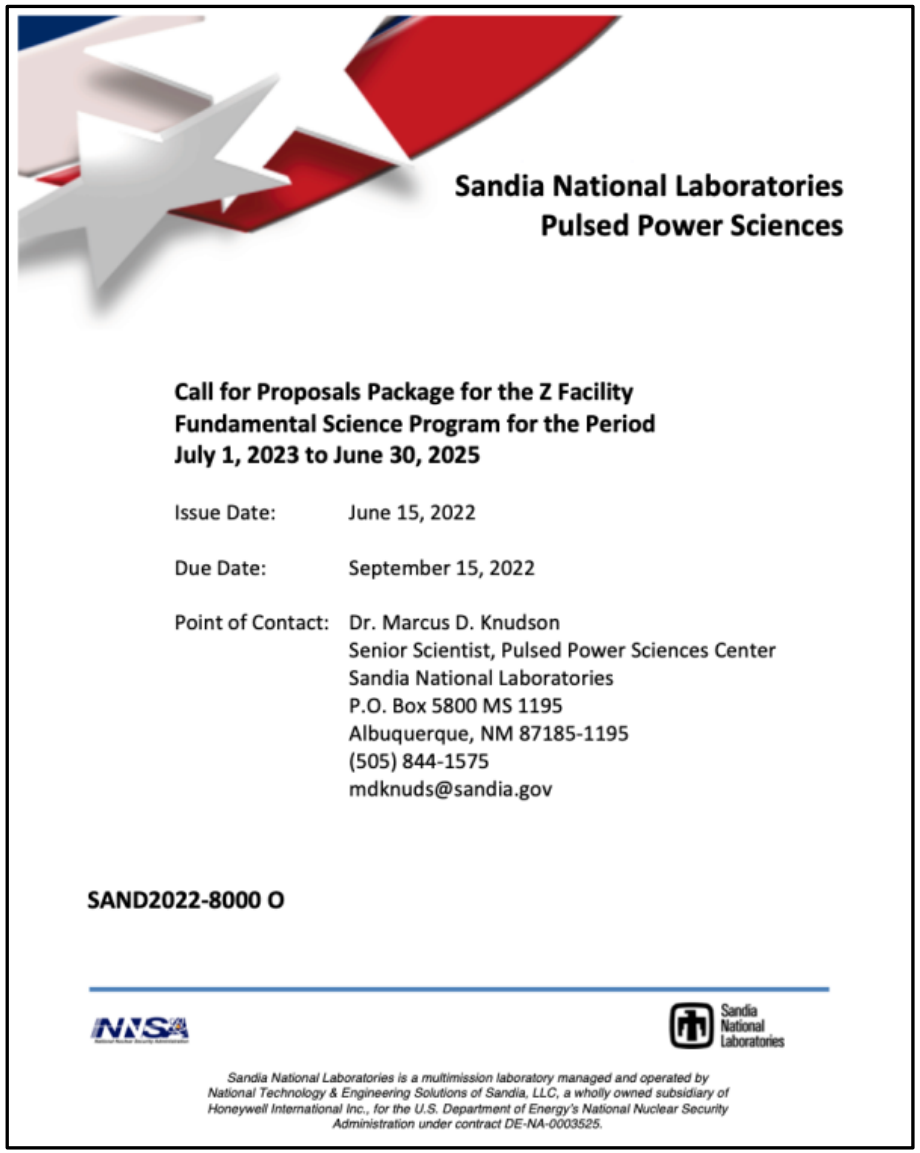
Tracy et al. with Chad McCoy and Sakun Duwal POCs
- Melting of iron-bearing Bridgmanite

3 shots: 1 / 2 / 0
actual: 1 / 2 / 0

ZFS Program 2022 Call for Proposals opened in June

- ZFSP call for proposals timeline:
  - –June 15: call for proposals open
    - Award period: July 1, 2023 through June 30, 2025
  - –August 3-5: ZFS Workshop
  - –September 15: call closes
  - –October/November: evaluation and selection
    - Facility review: experimental feasibility, safety, and diagnostics
    - Scientific review of international panel mid-November
    - Mid-December, distribution of shots
  - –December 15: notification of awards
    - Expectation is to allocate 14 shots

Two-year award period



Sandia National Laboratories
Pulsed Power Sciences

Call for Proposals Package for the Z Facility Fundamental Science Program for the Period July 1, 2023 to June 30, 2025

Issue Date: June 15, 2022

Due Date: September 15, 2022

Point of Contact: Dr. Marcus D. Knudson
Senior Scientist, Pulsed Power Sciences Center
Sandia National Laboratories
P.O. Box 5800 MS 1195
Albuquerque, NM 87185-1195
(505) 844-1575
mdknuds@sandia.gov

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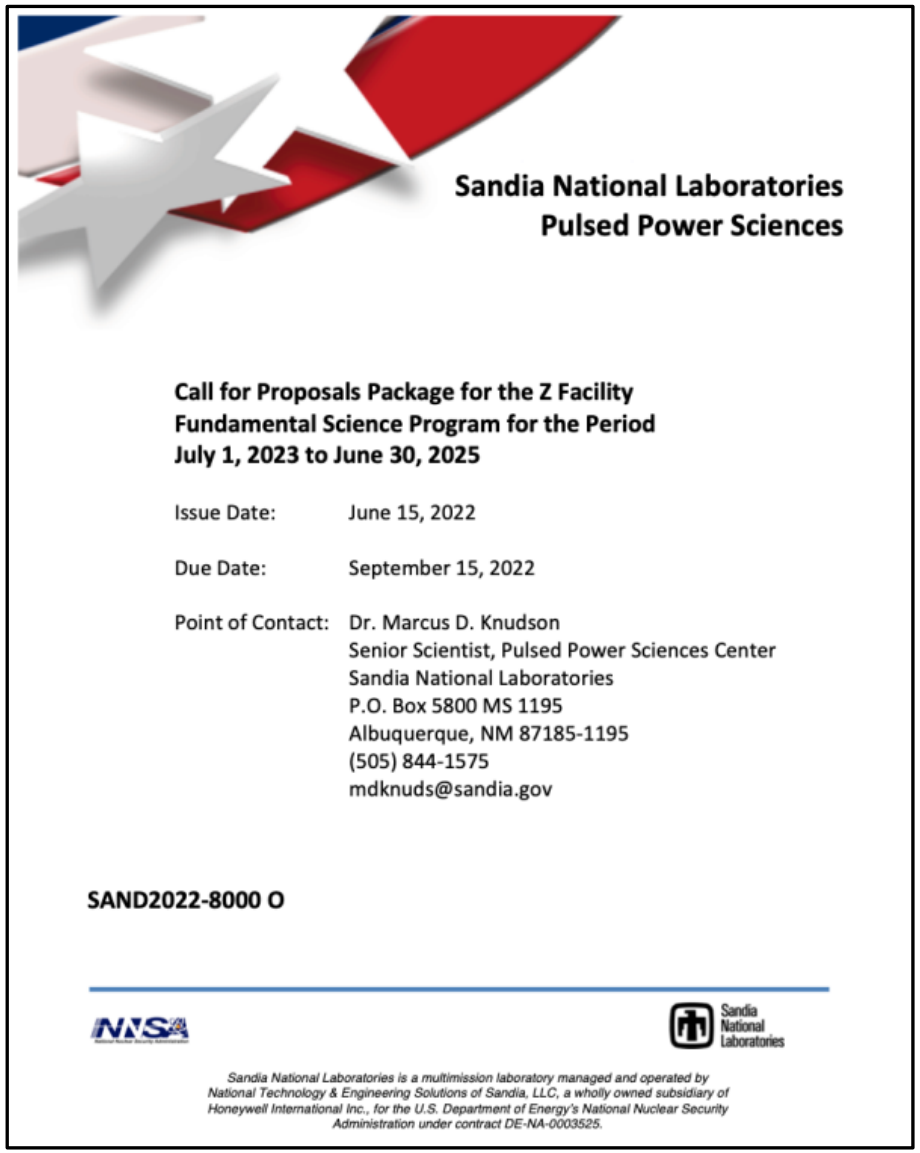
Proposals reviewed by independent, external review panel

Two-year award period

- Applications are technically evaluated based on four scientific/technical criteria:
  - Scientific and technical soundness and quality of the proposed method/approach, and the feasibility/likelihood of accomplishment of the stated objective
  - The overall scientific/technical merit of the project and its relevance and prospective contribution to its field of research
  - The competence, experience, and past performance of the applicant, principal investigator and/or key personnel
  - The demands of the project in terms of resource requirements (equipment, beam time, etc.) and/or other requirements (facility hardware modifications, component development, etc.) vis-à-vis competing demands.



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