

FINAL PROGRESS REPORT  
**Workshop on Fundamental Science using Pulsed  
Power**

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## Introduction

The project objective was to fund travel to a workshop organized by the Institute for High Energy Density Science (IHEDS) at the University of Texas at Austin. In so doing the intent was to a) Grow the national academic High Energy Density Science (HEDS) community, b) Expand high impact, discovery driven fundamental HEDS, and c) Facilitate user-oriented research.

The workshop under consideration, in the series related to the Z Fundamental Science Program (ZFSP), was held in Albuquerque, New Mexico. The P.I. of this grant, Alan Wootton, assisted with the organization and running of the meeting.

## User activities

Sessions involving Z-facility users (more accurately, collaborative users) were held as follows:

- Astrophysics, Planetary Science. Current ZFSP programs were discussed, concentrating on status and near term planning. Emphasis was placed on quantifiable scientific and educational progress. It was discussed whether there were possible growth areas in “off-Z-campus” projects that are relevant (especially academic).
- Magnetized HED. The meeting provided a forum to discuss current and possible future academic work relevant to Magnetized Liner Inertial Fusion (Maglif) Off-Z-Facilities-Campus, Maglif-relevant, magnetized HED science was discussed.
- Materials Science. This represents an important future area for ZFSP: Introductions and status talks on possible future materials science experiments on current and possible future Z facilities were presented. Academic interest in Z facility time and in related off-Z-campus work (especially academic) was discussed.
- Facilitate a User Meeting. This was for current and future users of the Z facilities, and those involved in related off-campus work. The meeting disseminated SNL expectations, possible growth areas, new facilities, diagnostics, and other capabilities. It provided a venue for User feedback.

Important was the introduction of the concept of an intermediate pulsed power facility at SNL, with (approximately) 10 MA current amplitude. This would provide a very useful platform for academic use, with lower powers but significantly higher repetition rate than the high powered Z facility

## Opportunities

Opportunities exist for increased fundamental science on Z in the areas of MagLIF, and Materials Science. In both cases ‘Off-Z campus’ research is possible, i.e. at academic institutions. On Z itself, opportunities will be limited by the number of Z shots made available for this program, and the collaborative SNL staff required for any collaborative User experiments to be successful.

A summary of metrics shows that ZFSP experiments have been successful, with over 20 peer reviewed articles published, including in Science and Nature. As a result of the ZFSP workshops, and reviews thereof, a call for proposals for experimental time on Z was published in 2015. Successful proposals for time included those by attendees at the workshop under discussion, including in the new-to-ZFSP area of fundamental materials science.

## Conclusions

The workshop played an important role in academic research by guiding academia to utilize a world-class, unique capability: the Z facility at SNL. Scientists and students from eight academic institutions are now involved. These include new-to-HEDS researchers. The quality of the scientists actively involved is demonstrated by their nine scientific society fellowships. The HEDS community is growing, and the ZFSP is flourishing.