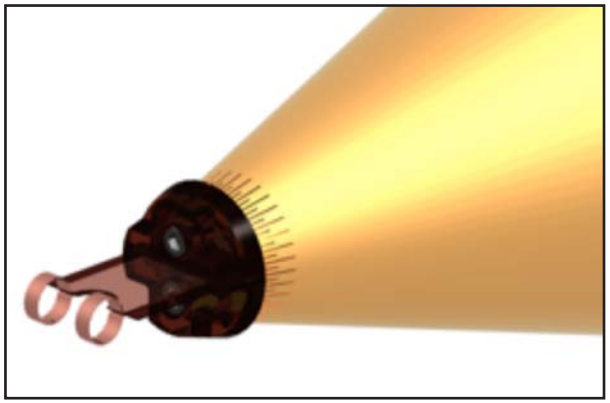
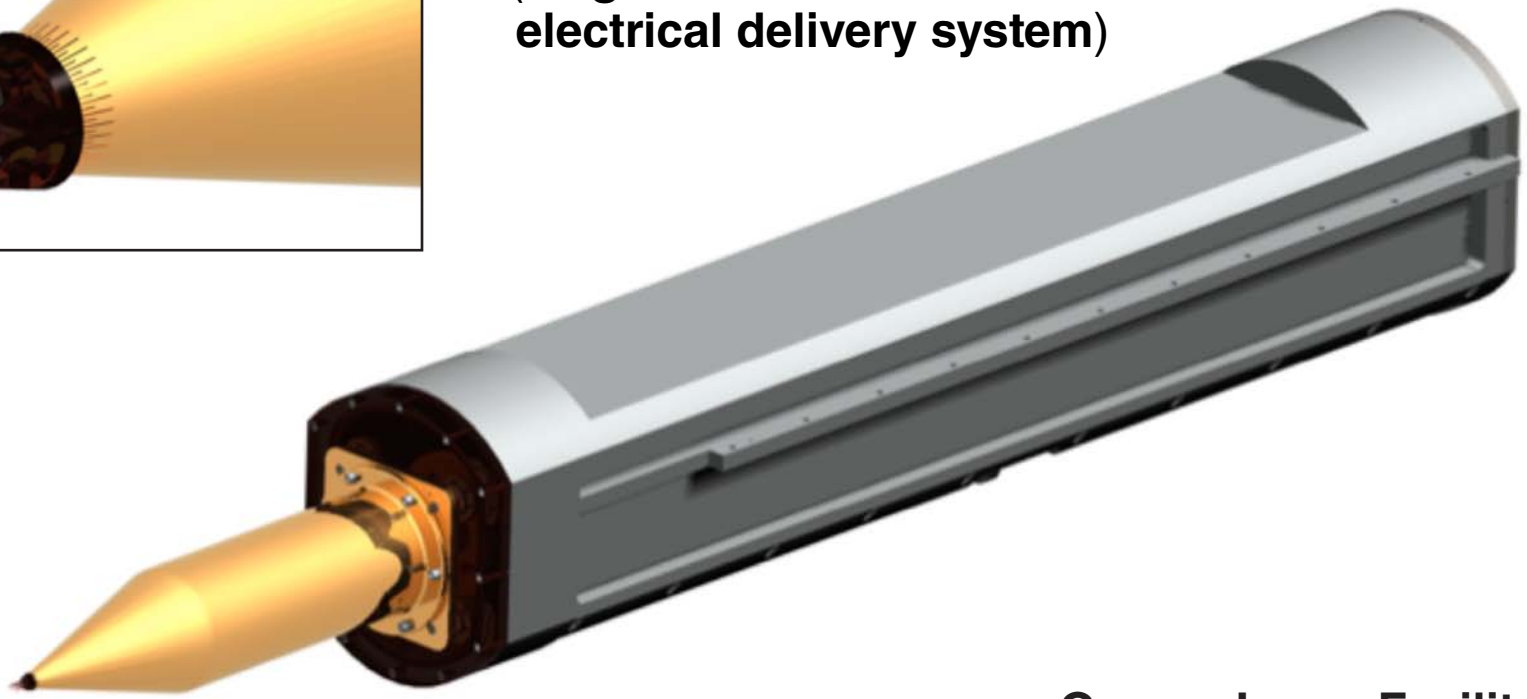
Developing Magnetic Platforms for Inertial Confinement Fusion (ICF) and Basic High-Energy-Density (HED) Science



Upgraded MIFEDS
(Magnetized-inertial fusion electrical delivery system)



G. Fiksel
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Omega Laser Facility
Users' Group Workshop
Rochester, NY
25 April 2012

Summary

An upgraded MIFEDS will create a higher magnetic field and will be used both on OMEGA and OMEGA EP

UR LLE

- An external magnetic field is needed in many ICF and high-energy-density-physics (HEDP) experiments
- The existing MIFEDS device is being upgraded to
  - increase the stored energy and magnetic field
  - improve and simplify user interface
  - use on both OMEGA and OMEGA EP
- First deployment is expected in September 2012

MIFEDS will operate as a facility diagnostic.

Collaborators

**P.-Y. Chang, M. Hohenberger, R. Betti, M. J. Shoup III,
C. Taylor, T. Duffy, D. J. Lonobile, and W. A. Bittle**

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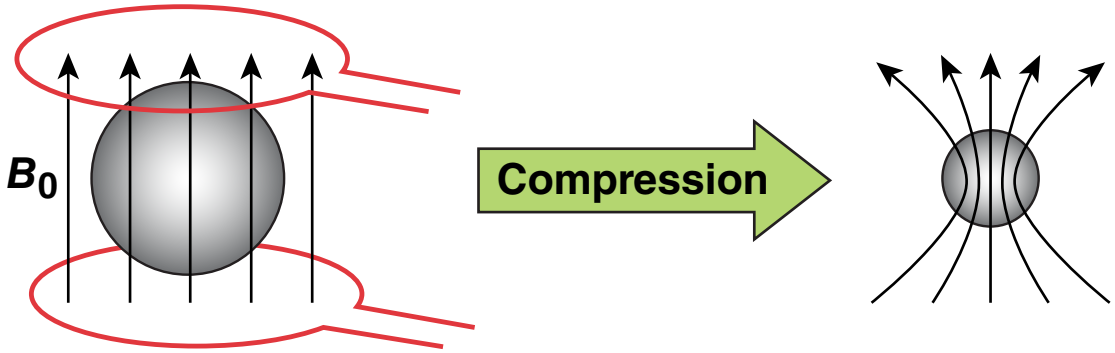
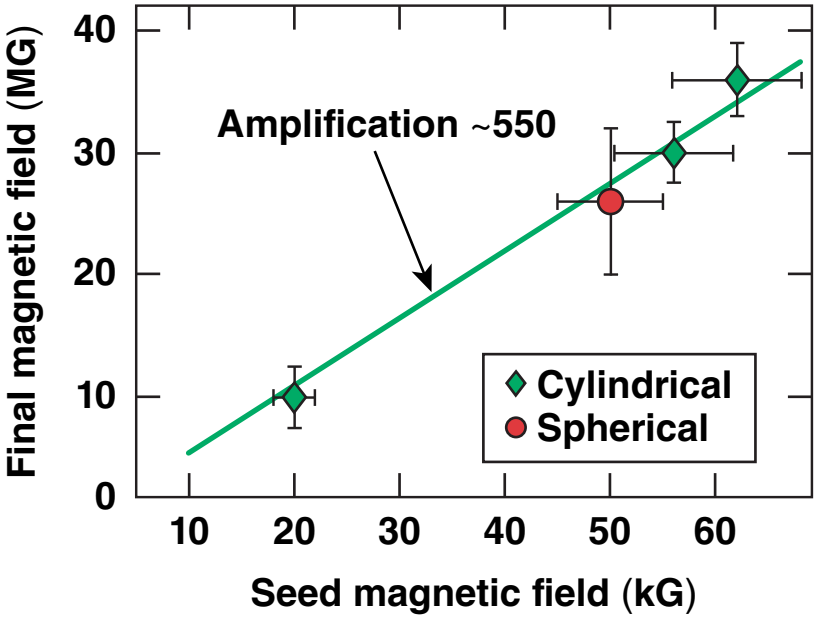
MIFEDS has been used to enhance fusion in magnetized ICF implosions



- Compressed field is amplified by ~550
- Neutron yield is increased by 30%
- Ion temperature is increased by 15%



P.-Y. Chang *et al.*, Phys. Rev. Lett. 107, 035006 (2011).

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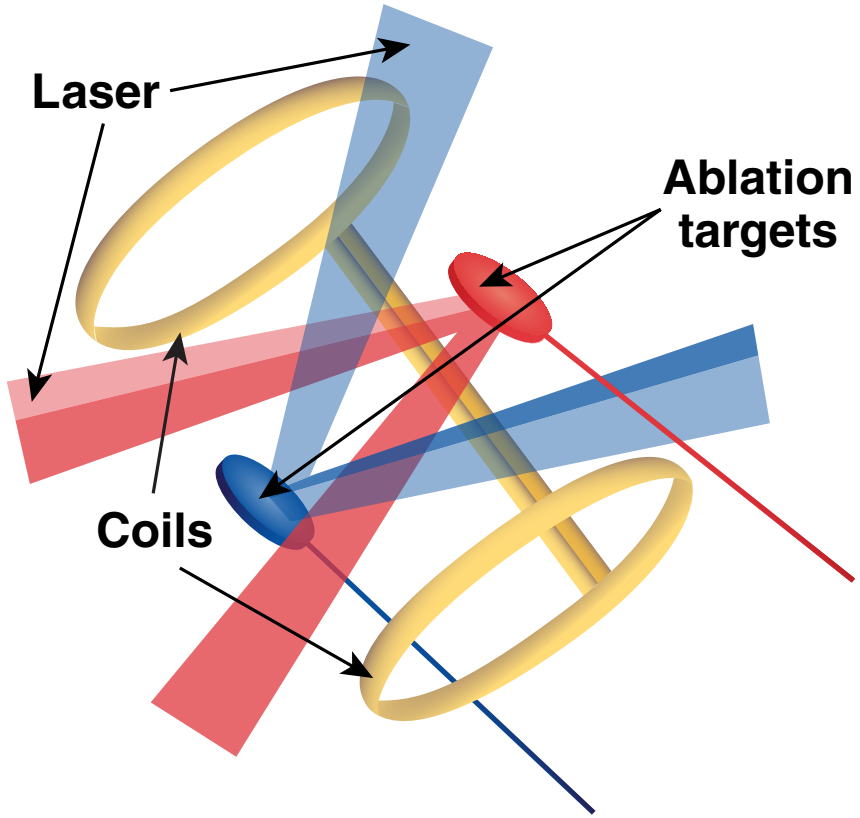
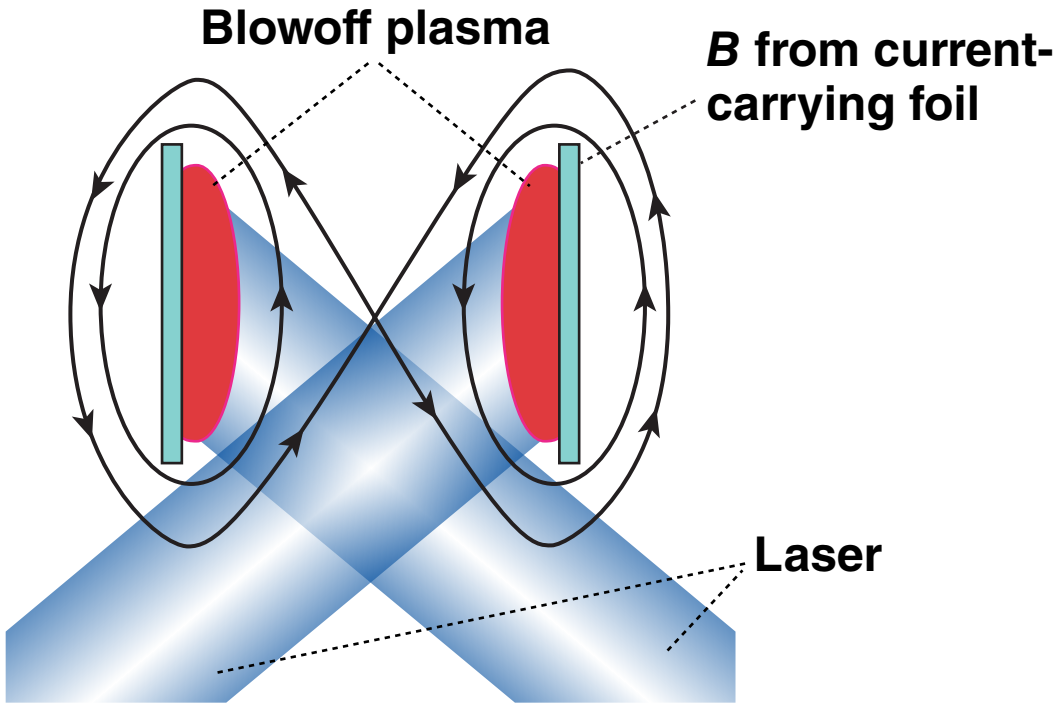
MIFEDS has been used recently (24 April) in collisionless shock experiments lead by LLE



MIFEDS will be used in magnetic-reconnection experiments in collaboration with the University of New Hampshire



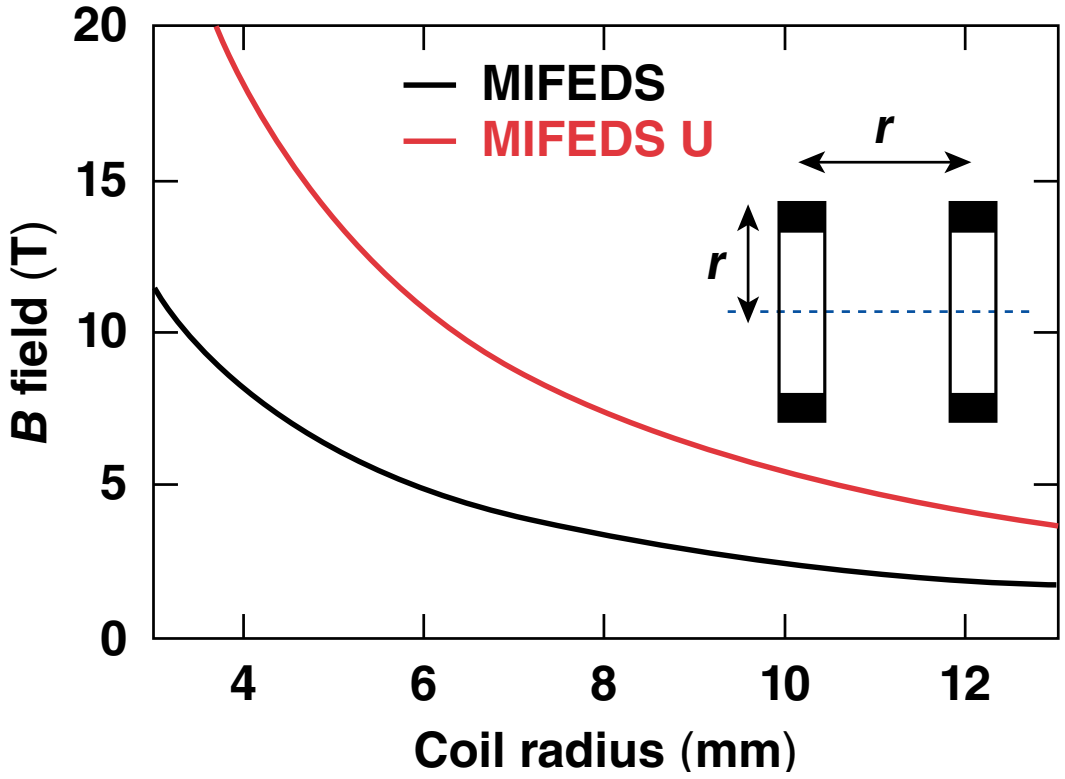
Several critical improvements will be implemented

- Increase the stored energy (×5)
- Replace the laser-triggered gap to a high-voltage triggered gap with an anticipated jitter of <10 ns
- Replace the strip transmission line by a coaxial line with reduced inductance and improved vacuum interface
- Provide magnetic field for both OMEGA and OMEGA EP
- Improve reliability, safety, and user-friendliness

Magnetic field will be increased

- Magnetic storage energy is increased five-fold
  - increase *B*
  - increase volume
  - both

MIFEDS original and upgraded: comparison of *B* for Helmholtz coil



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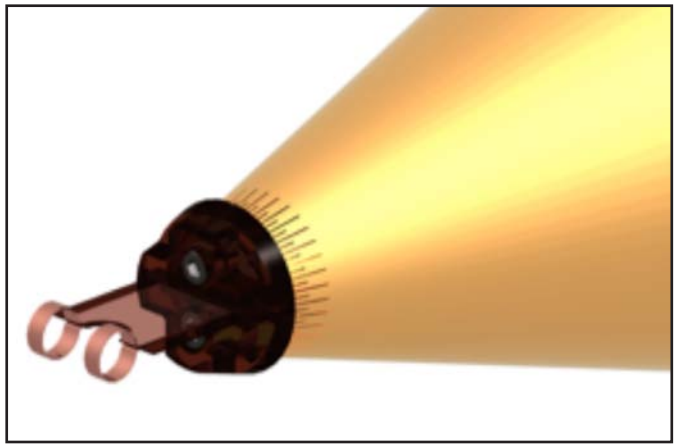
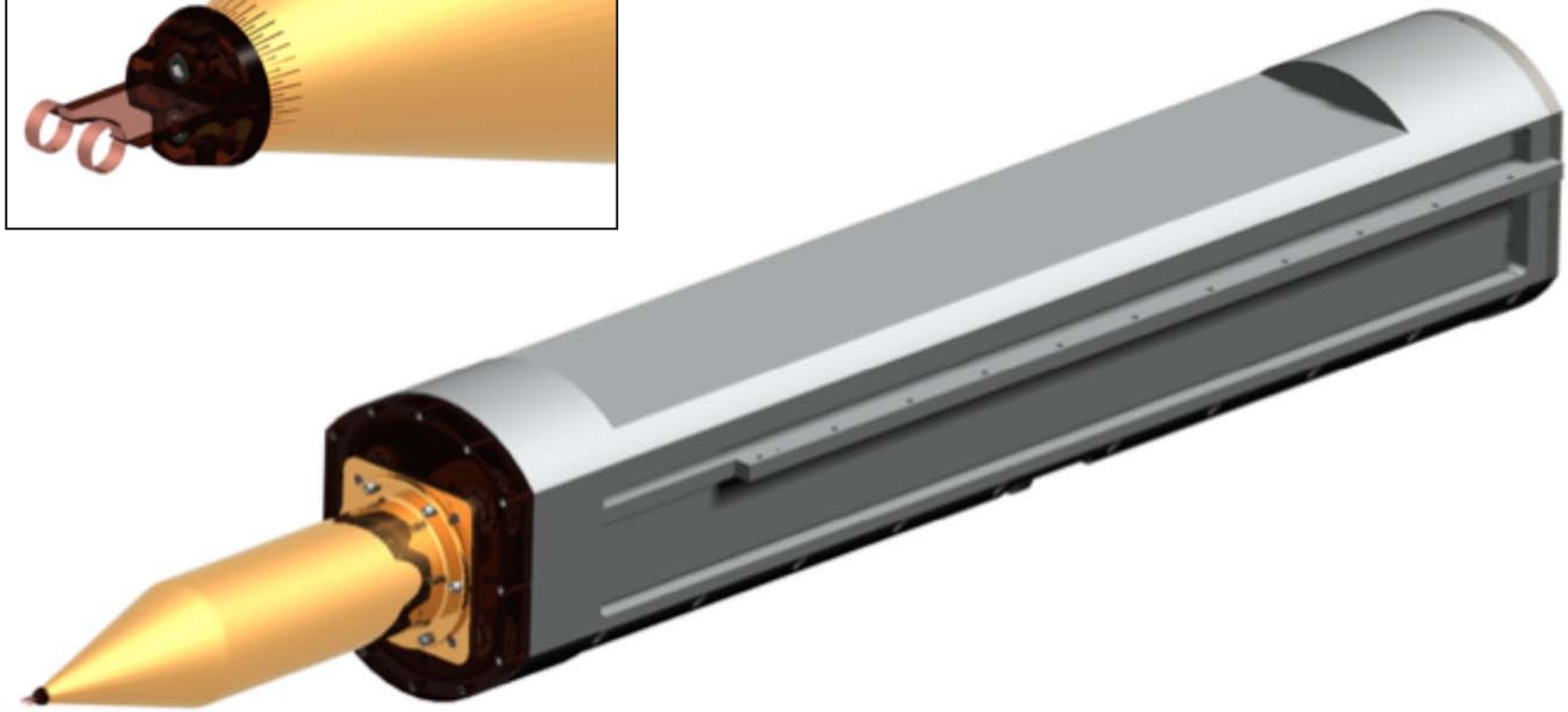
The magnetic coil assembly can be rotated, which greatly expands experimental possibilities



Assembled MIFEDS to be loaded into a TIM boat



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Summary/Conclusions

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