

DOD Basic Science

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DOD Basic Science

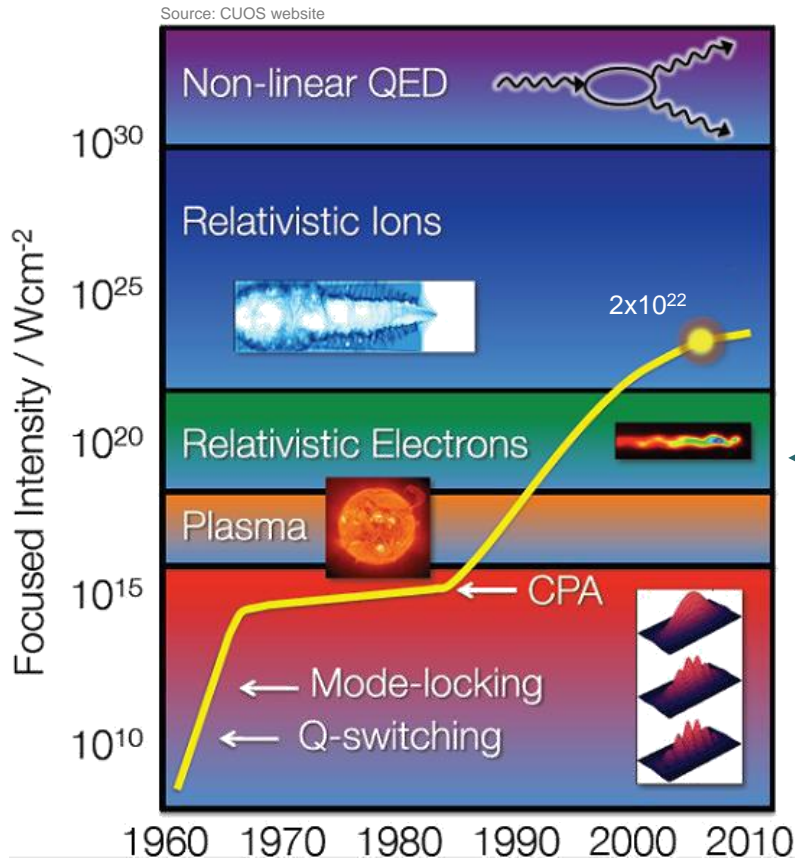
- We're not the NSF, but rather service oriented basic science organization
 - Outstanding, open, publishable science
 - Relevance to the service mission
- Typical HEDP problems of interest to the DOD
 - Relativistic Optics
 - Directed Energy
 - Active Detection
 - Enabling technology (fs-lasers, novel pulsed power)



Progress in peak intensity

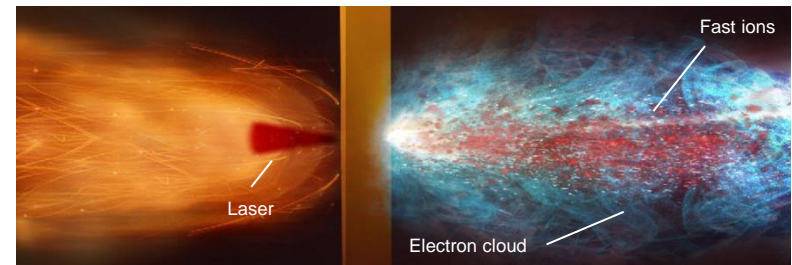


- Over the last two decades, a 6 order of magnitude increase in achieved focused intensities in table-top systems.



Laser wakefield electron acceleration (simulation)

Relativistic plasmas
 Electron & ion acceleration
 X-ray & neutron generation



Laser-irradiated solid target (artist's view)

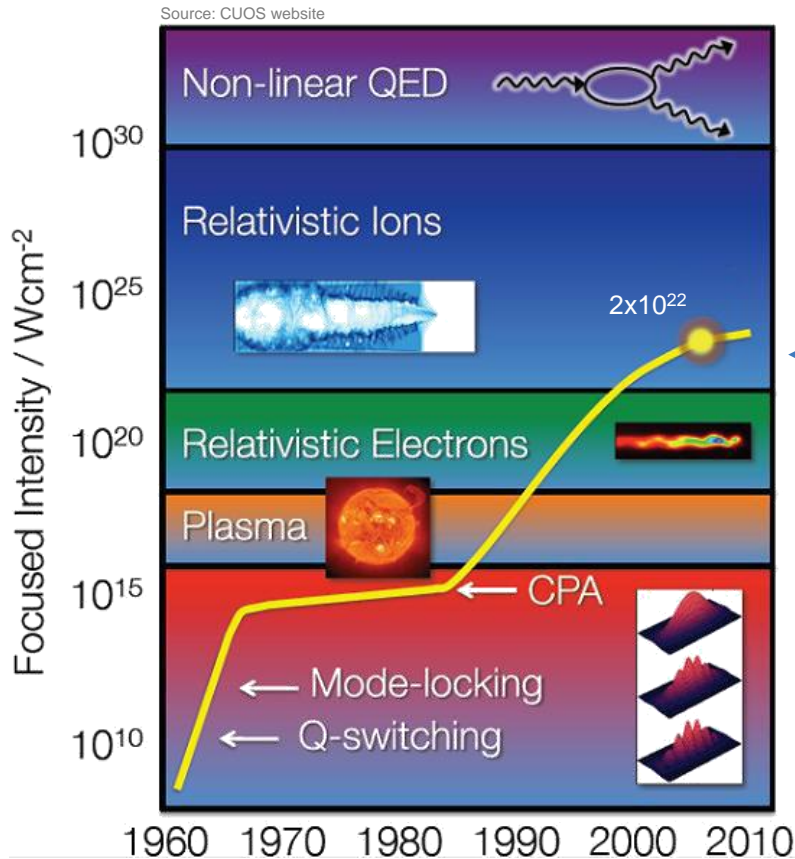
DOI: 10.1103/RevModPhys.85.751



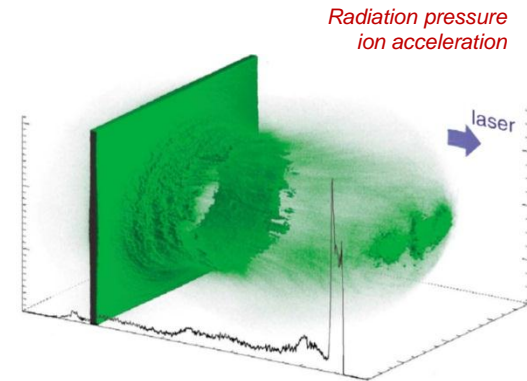
Progress in peak intensity



- Over the last two decades, a 6 order of magnitude increase in achieved focused intensities in table-top systems.



Ultra relativistic plasmas
 γ -ray production
Heavy ion acceleration
Radiation reaction
Nonlinearity of vacuum (QED)
Particle creation



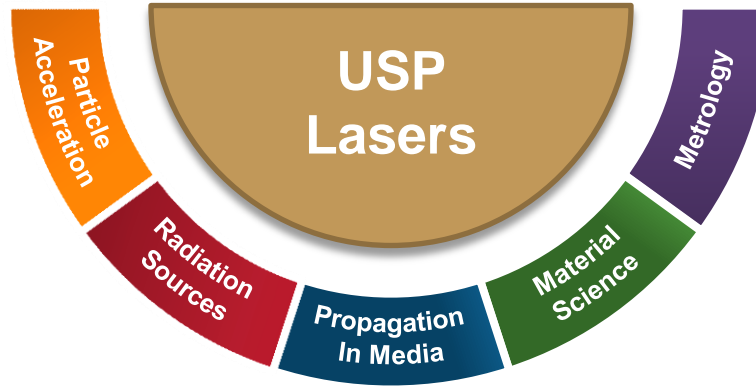
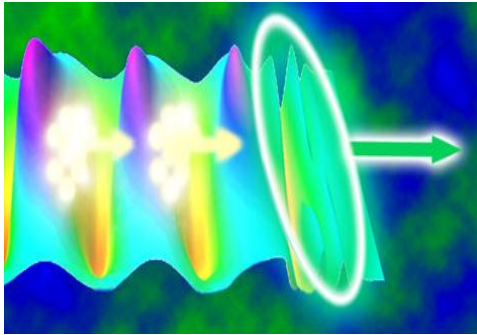


Applications of USP Lasers



Particle Acceleration

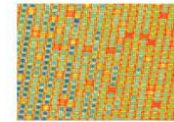
ultrahigh electric field gradients



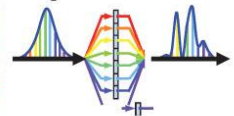
Metrology

stabilized, ultra-wide bandwidth

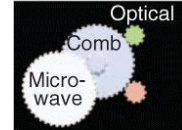
Spectroscopy



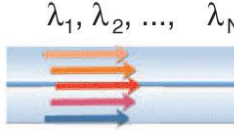
Waveform generation



Optical clocks



Telecommunication



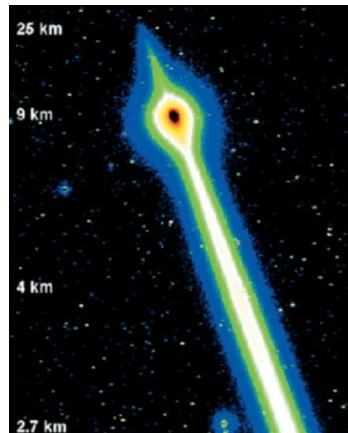
Secondary Radiation Sources

generation of particle & photons



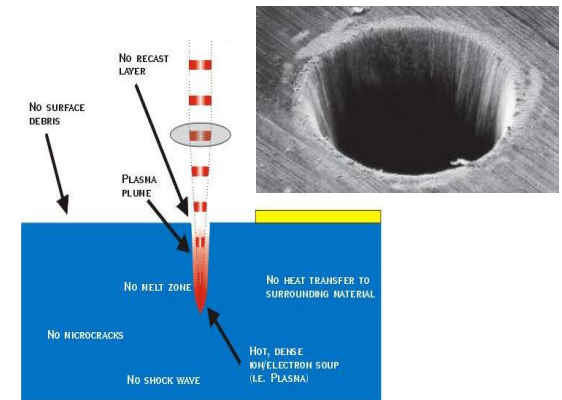
Propagation in media

self-channeling



Material Science

ultrashort, high peak power





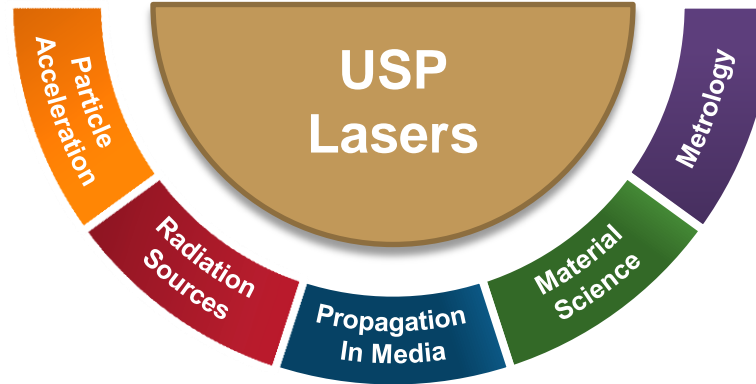
Applications of USP Lasers



Particle Acceleration

ultrahigh electric field gradients

- Table-top GeV electron accelerators
- MeV ion sources for imaging
- Isotope production
- Hadron tumor therapy
- Proton-based fast ignition



Metrology

stabilized, ultra-wide bandwidth

- Ultra-stable freq sources
- Optical waveform synthesis
- High precision spectroscopy
- Frequency/time transfer
- High-capacity comms
- Coherent LIDAR
- Optical clocks
- Calibration

Secondary Radiation Sources

generation of particle & photons

- High power THz generation
- Extreme ultraviolet lithography
- Biological soft x-ray microscopy
- Non-destructive evaluation
- Medical imaging/therapy

Propagation in media

self-channeling

- Remote sensing
- Remote tagging
- Directed energy
- Electronic warfare
- Countermeasures
- Advanced sonar

Material Science

ultrashort, high peak power

- Surgery
- Chemical analysis (LIBS)
- Surface property modification
- Non-equilibrium ablation
- Micromachining
- Ultrafast photochemistry
- Attochemistry

Calls, BAAs, FOAs

- Air Force Office of Scientific Research
 - <http://www.wpafb.af.mil/afri/afosr/>
- Army Research Office
 - <http://www.arl.army.mil/www/default.cfm?page=506>
- Office of Naval Research
 - <http://www.onr.navy.mil/>
- Defense Threat Reduction Agency
 - <http://www.dtra.mil/>
- DOD SBIR/STTR Program
 - <http://www.acq.osd.mil/osbp/sbir/>

<http://www.grants.gov/web/grants/home.html> or <https://www.fbo.gov/>

High Energy Density Basic Science

- AFOSR
 - John Luginsland, Jason Marshall, Riq Parra
- ARO
 - Rich Hammond, Jim Harvey
- ONR
 - Ryan Hoffman
- DTRA
 - David Peterson