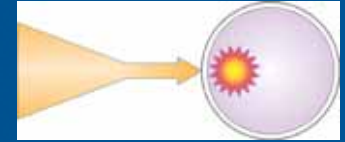


# Targets for Benchmark Experiments



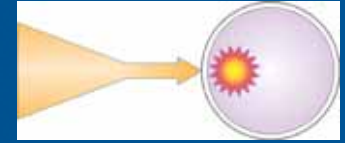
**Rich Stephens**  
**General Atomics**

- **Laser Facility - J. Pasley**
- **Analysis tools - M.-S. Wei**
- **Diagnostics - L. Van Woerkom, M. Key**

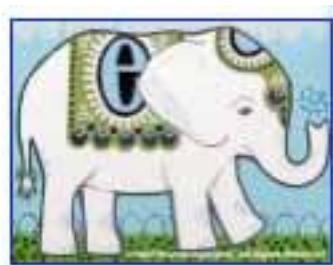
**Summary - F. Beg**

**3<sup>rd</sup> Fusion Science Center meeting**  
**Rochester, NY**  
**27 January 2006**

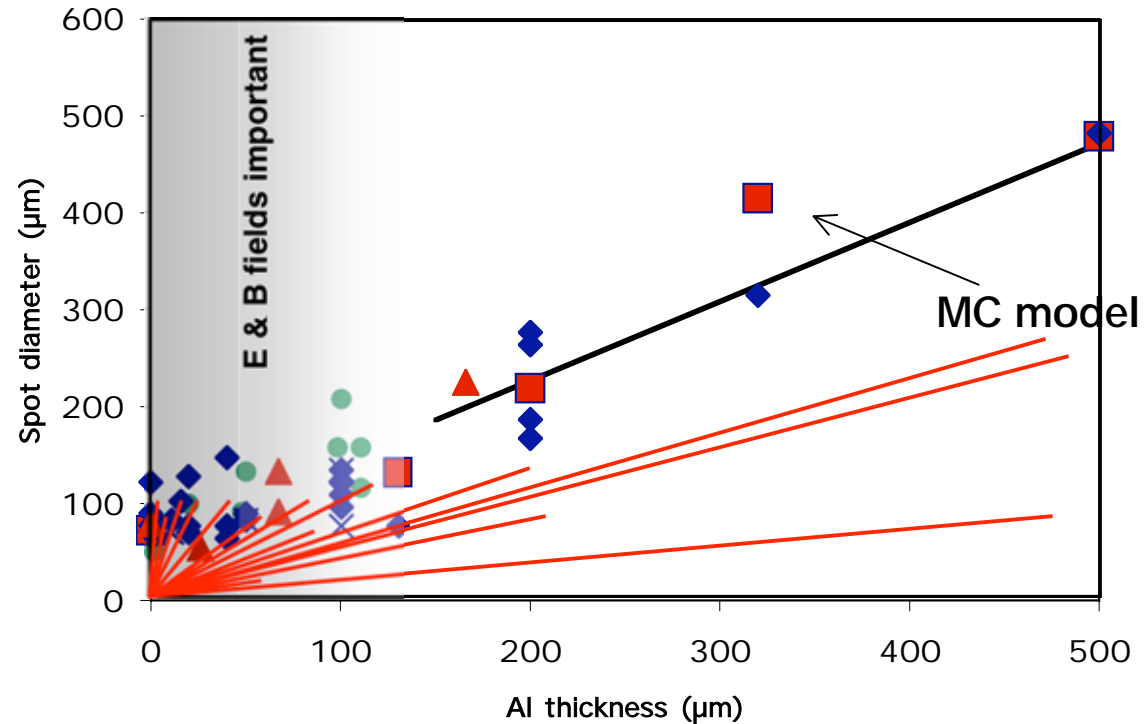
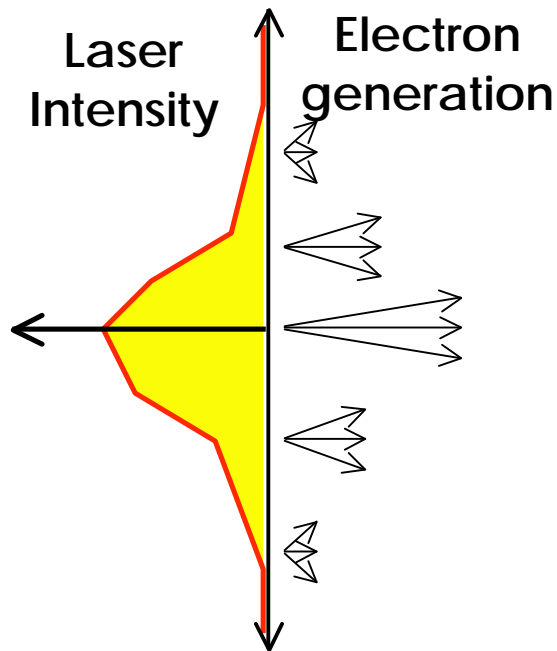
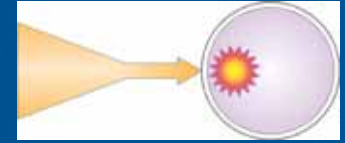
# Goal to design and field benchmark expts



- Current experiments have been modeled descriptively
  - Experiments too complex to model
  - Codes can't model at scale length of experiments
  - Parameters too uncertain for use in code validation



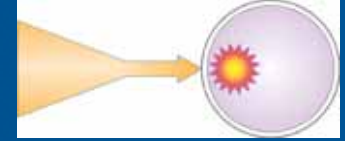
# e<sup>-</sup> transport described w/o E/M fields!



- e<sup>-</sup> generation efficiency & energy from local intensity (Beg scaling)
- Random transverse momentum independent of location
- Includes scattering, but no fields.

Physics hidden in heuristic rules

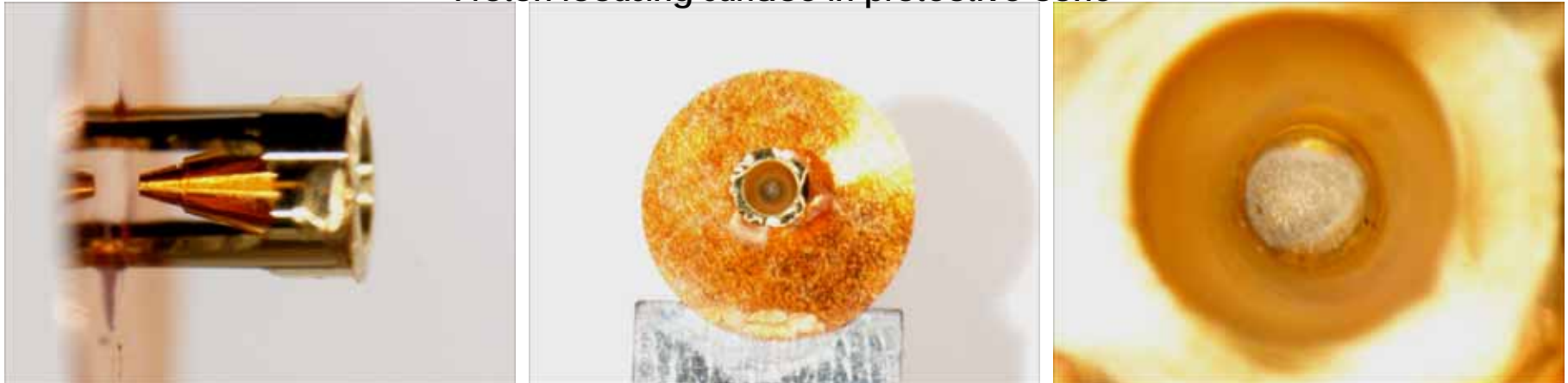
# Targets integrate several components



## Previous targets

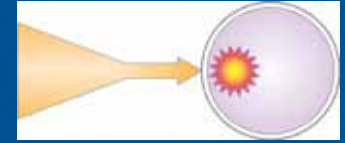
- Designed to show FI performance specs
- Complicated geometry
- Intertwined phenomena

Proton focusing surface in protective cone

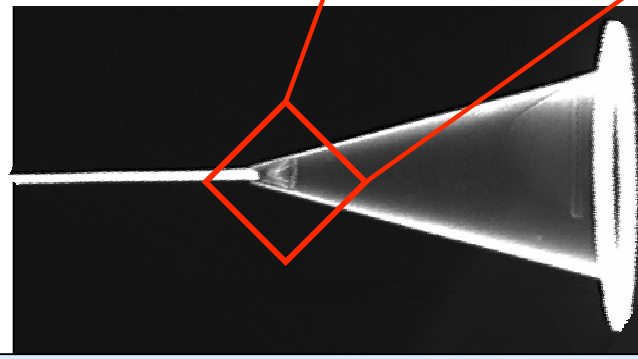
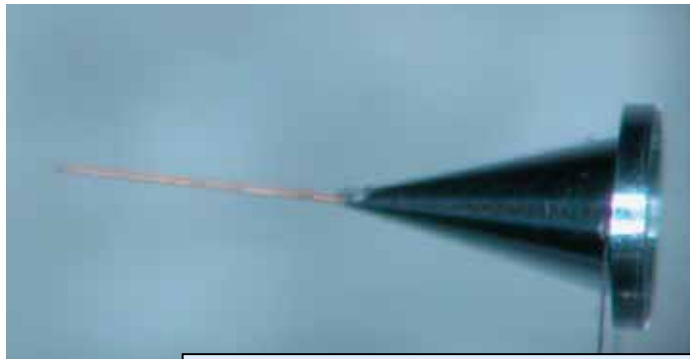
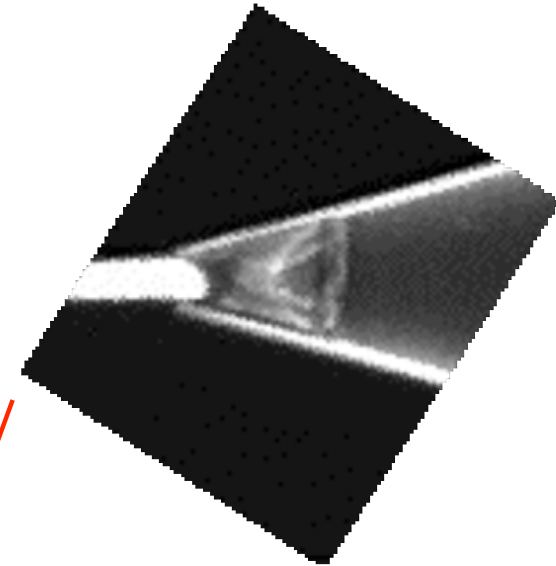


Target should be focused on one phenomenon

# Laser interactions variable and complex

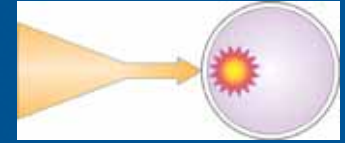


- Characterize laser pulses
- Improve interaction area
  - Simple geometry
  - Insensitive to pointing errors



Target simplify laser interaction

# Goal to design and field benchmark expts



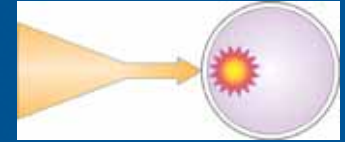
- Current experiments have been modeled descriptively
  - Experiments too complex to model
  - Codes can't model at scale length of experiments
  - Parameters too uncertain for use in code validation

⇒ Remove free parameters:

- Use simple geometries
  - Focus on single phenomena
  - Small enough to be modeled
  - Compatible with laser pointing errors
- Carefully characterize laser pulse
- Carefully characterize experiments

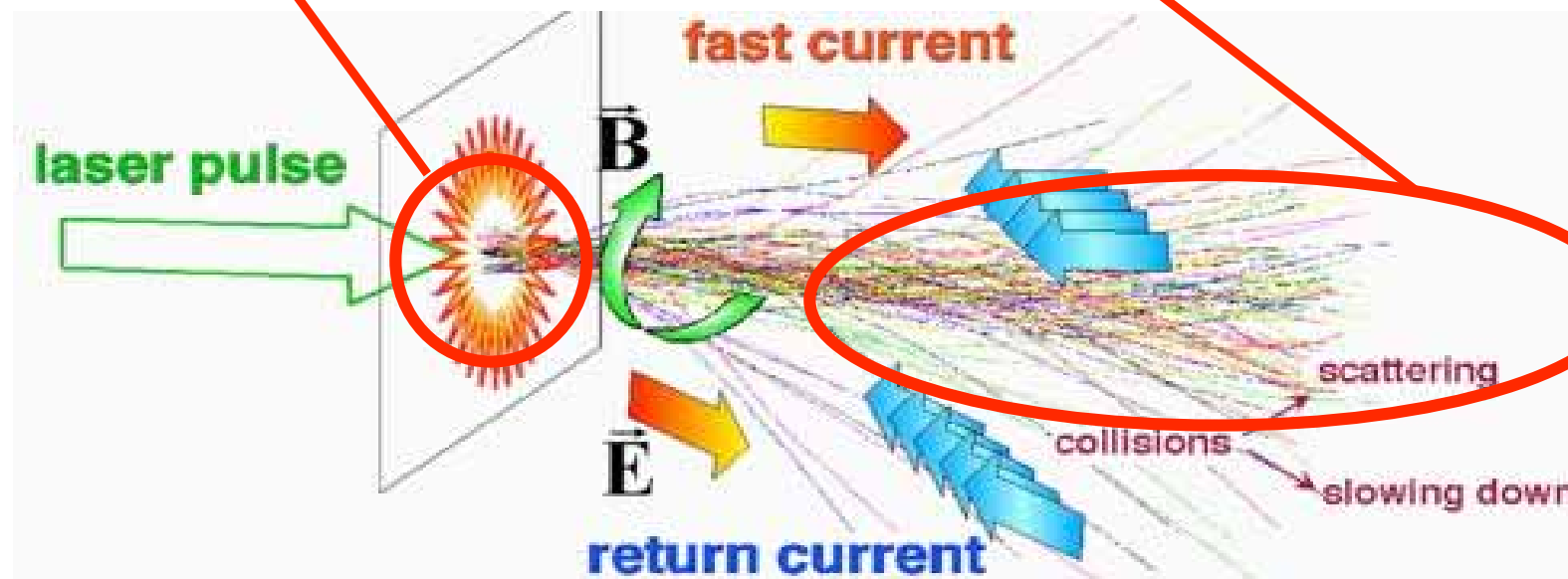


Have to focus experiments on specific regions



## Laser plasma Interaction

### Electron Transport

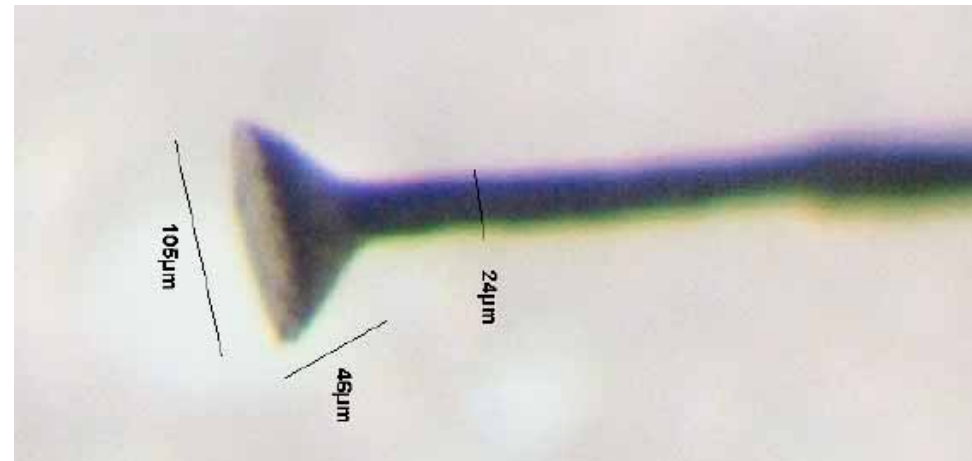
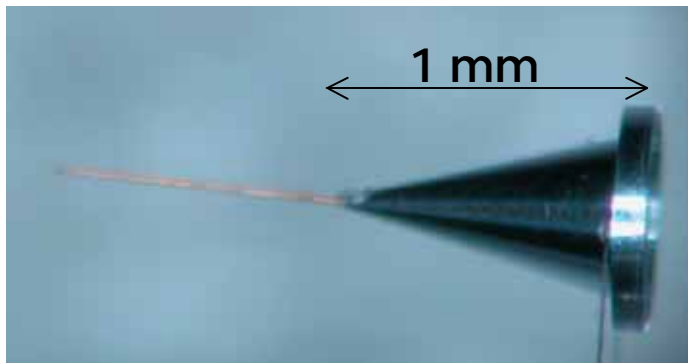


Hybrid PIC model ( Paris ) ( C Toupin et al. In Inertial Fusion Science and Applications 99 Publ. Elsevier p471 (2000)

# Electron transport at high current density



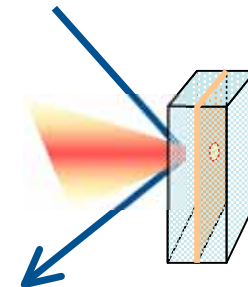
- Test modeling by PIC-hybrid codes
- Go to 1-D geometry -- But simplify
  - Simplifies electron paths
  - Improves diagnostic access
  - Maximizes signal?
  - Cheaper



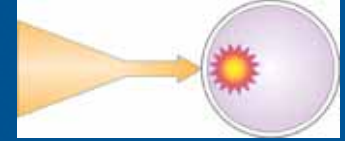
# Laser plasma interface



- Test PIC codes description of electron generation
- Targets are flat foils
  - Micromachined flat surface
  - Slightly buried fluorescent layer
- **Look directly at interface**
  - Time sensitive reflectivity
  - Electrons injected into metal
- **Control plasma gradient with controlled prepulse**

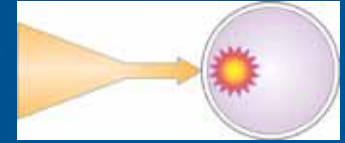


# Experiments to define plasma conditions



- **Future benchmarking experiments will need well defined hot plasma**
  - Density, temperature for useable scale length
- **Aerogel/Foam experiments will be used to develop proper characterization**
  - Titan, EP are suitable platforms

# These targets are part of carefully defined experiments on ZPW



- Laser - Pasley
- Analysis - Wei
- Diagnostics - Van Woerkom

