

**LAPPD Program Review
December 9-10, 2012
Argonne National Lab**

Microcapillary Development

**Dan Bennis (presenter)
Chris Craven
Michael Detarando
John Escolas
Michael Minot
Joe Renaud**

Capillary Development

- Results of 10, 5, and 2 μ m multi-multi capillary draw tests.
- Etchable core draw tests
- Other Capillary developments.



Bright Ideas in Fiberoptics

Capillary Developments

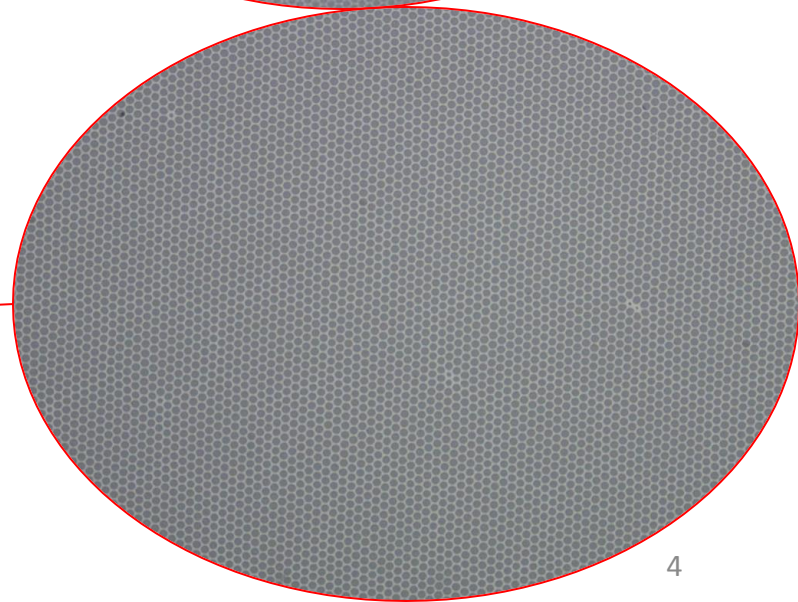
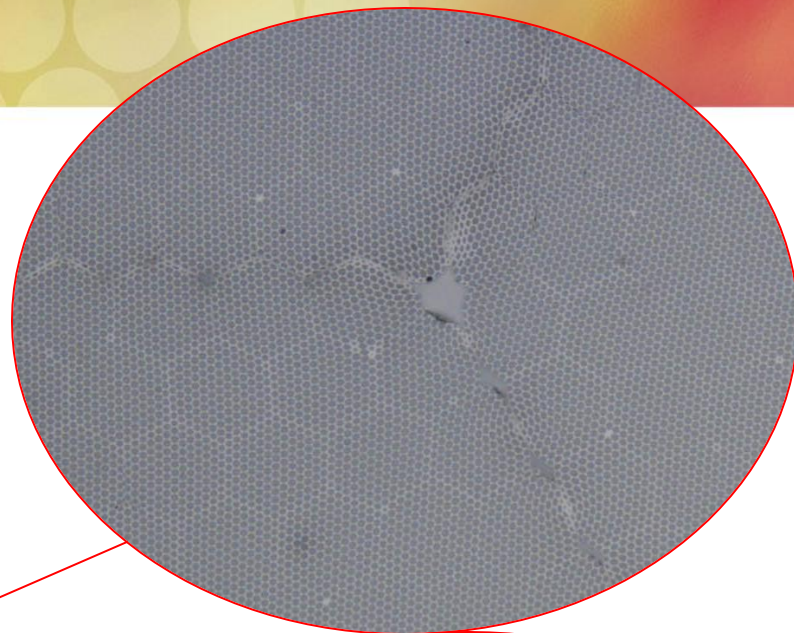
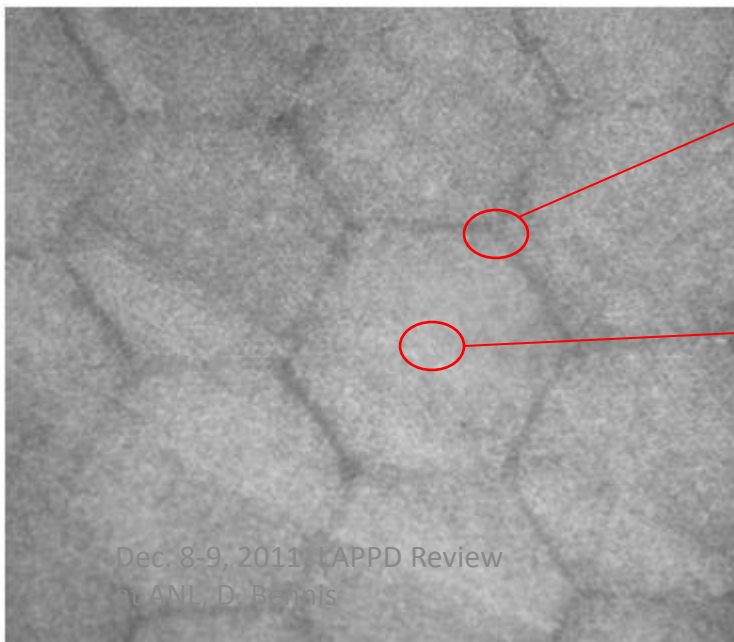
Pursuing a Multi-Multi draw approach:

- Test draws done at 10, 5, and 2 μ m capillary diameters.
 - Opens up <20 μ m size range for high resolution TOF applications.
 - Results can be scaled up to 20 μ m
- Multi-multi approach will result in a larger building block for 8"x8" block
 - shorter lead time
 - reduced cost
- Solid core etch trials.
- 2 μ m Photonic Bandgap Accelerator Program

10 μ m Multi-Multi

M-M stacking issues and Triple-points.

Similar to first generation 20 μ m
Images of cleaned and polished
capillaries. (ET 3427)

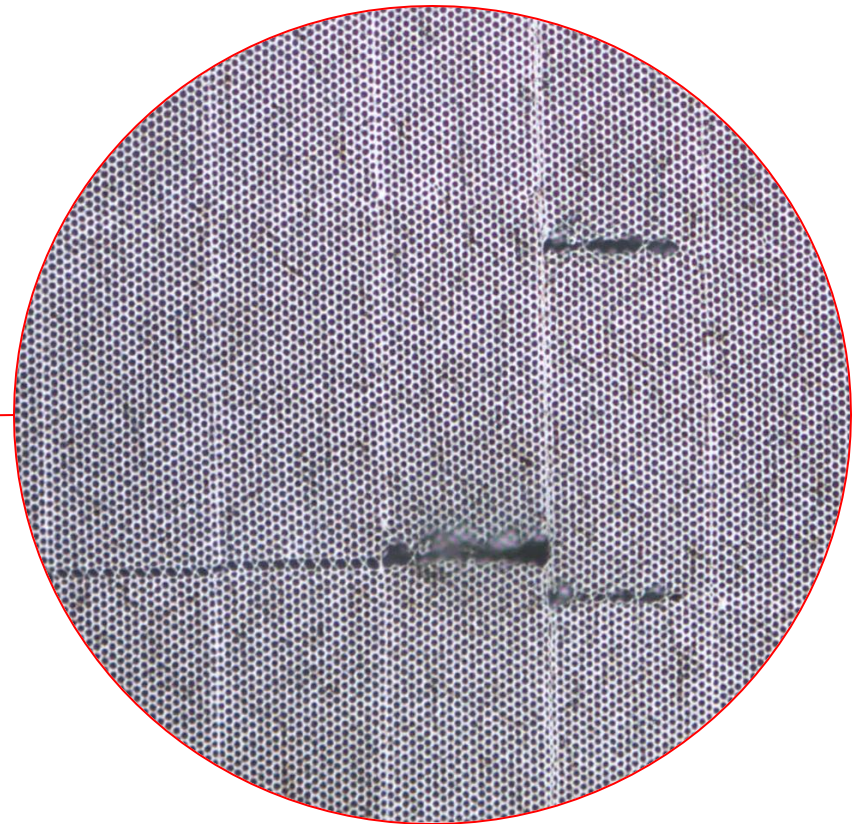
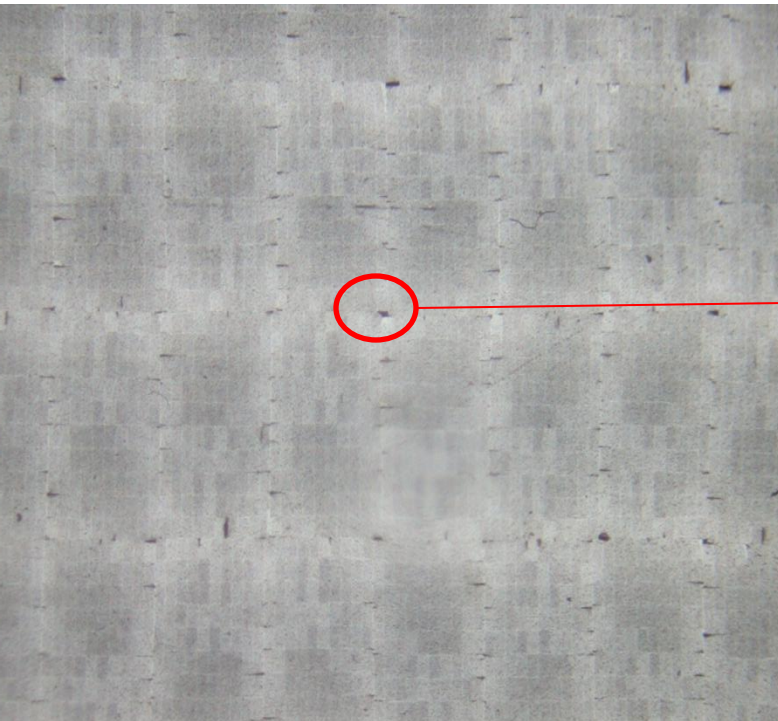


5 μ m Multi-Multi

Uses a rectangle pack instead of hexes

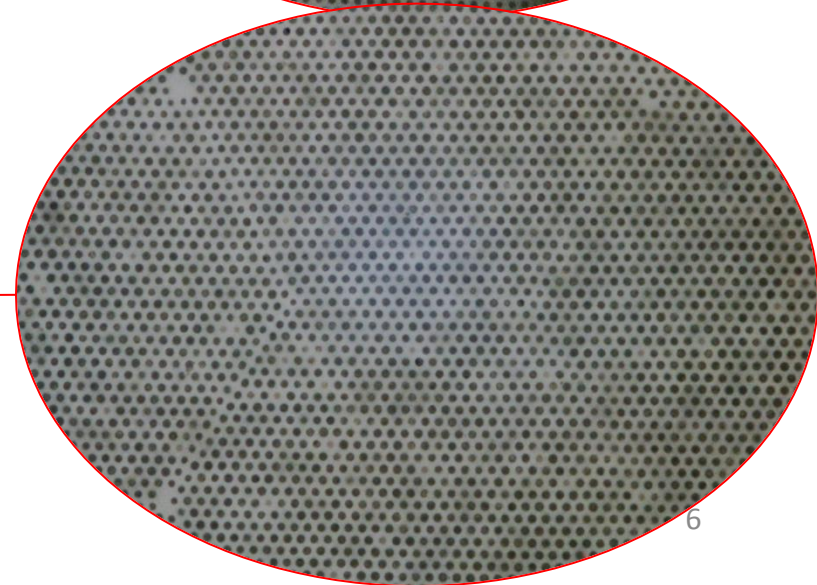
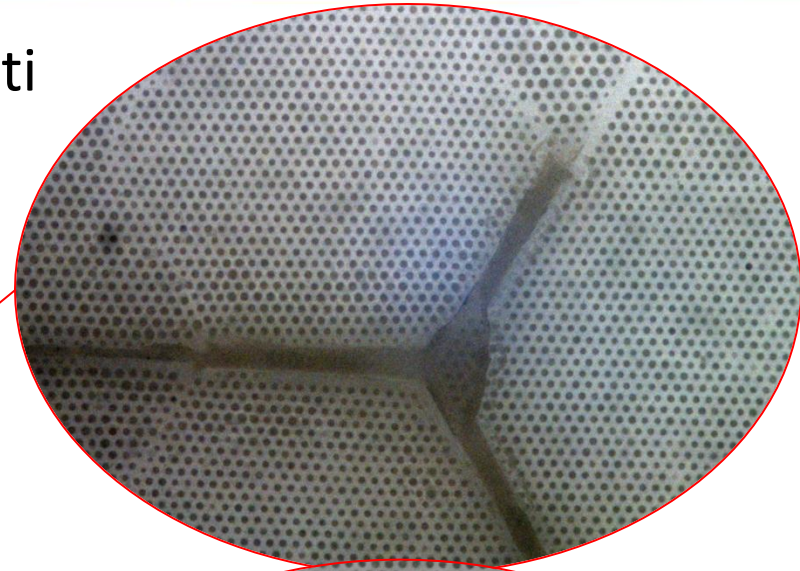
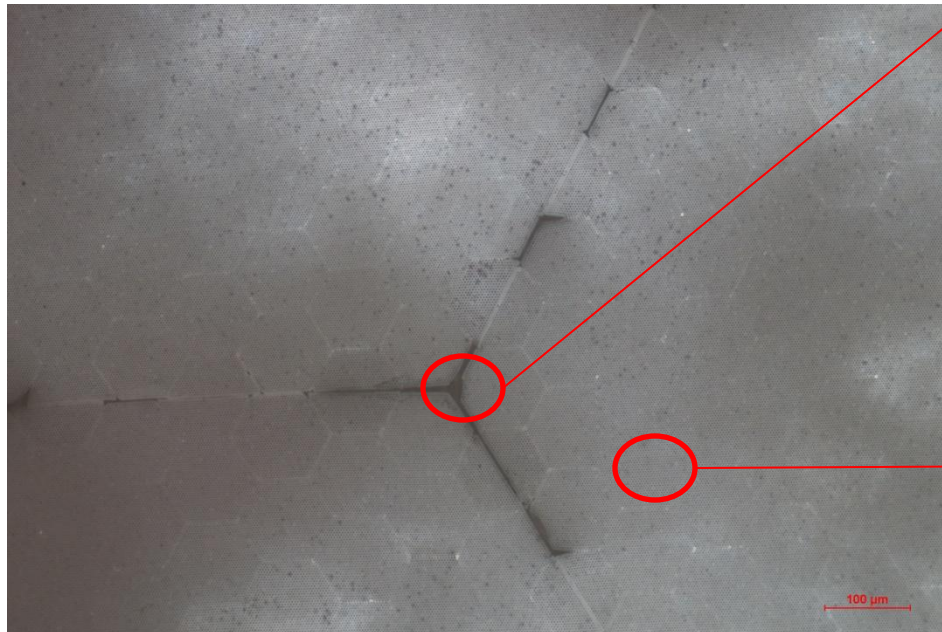
Linear stacking spaces.

Images of as cut capillary. (ET 3550)



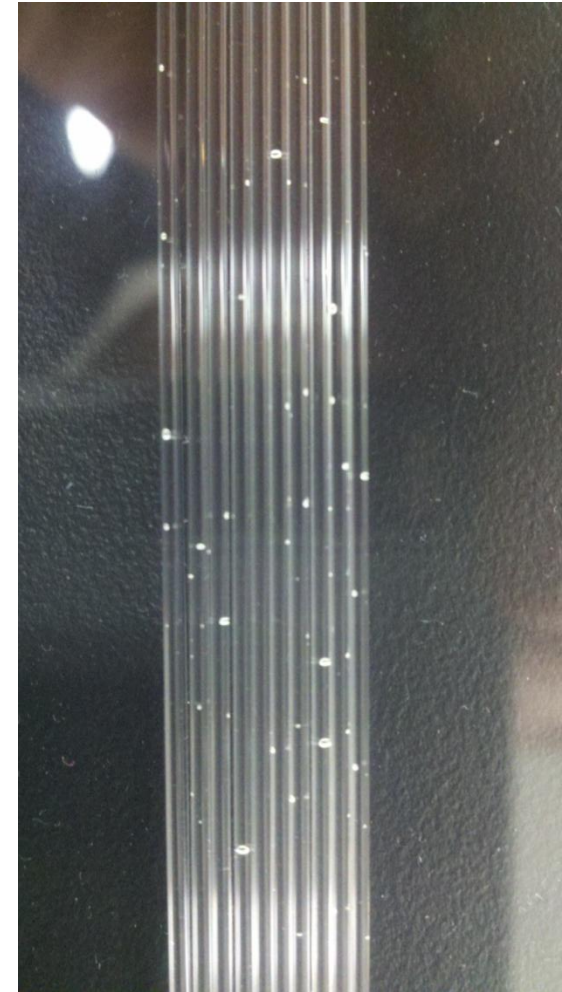
2 μ m Multi-Multi

Uses a half-hex on the edge of multi-multi
Some M-M boundary spaces.
Images of polished capillaries pre
cleaning. (ET 3631)



Etched Core:

- Initial draw trails conducted to evaluate potential etchable core materials.
 - First core material tested had a high etch rate, but low viscosity resulting in voids in the fibers. (Pictured on the right)
- New core material selected with a higher viscosity to address drawing issues, and a slower etch rate.
 - delivery of new etchable core material 1-3 weeks.
- Etched capillary samples to Argonne February.

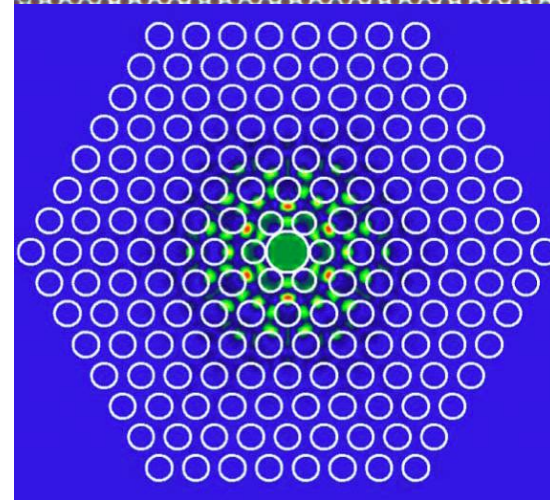
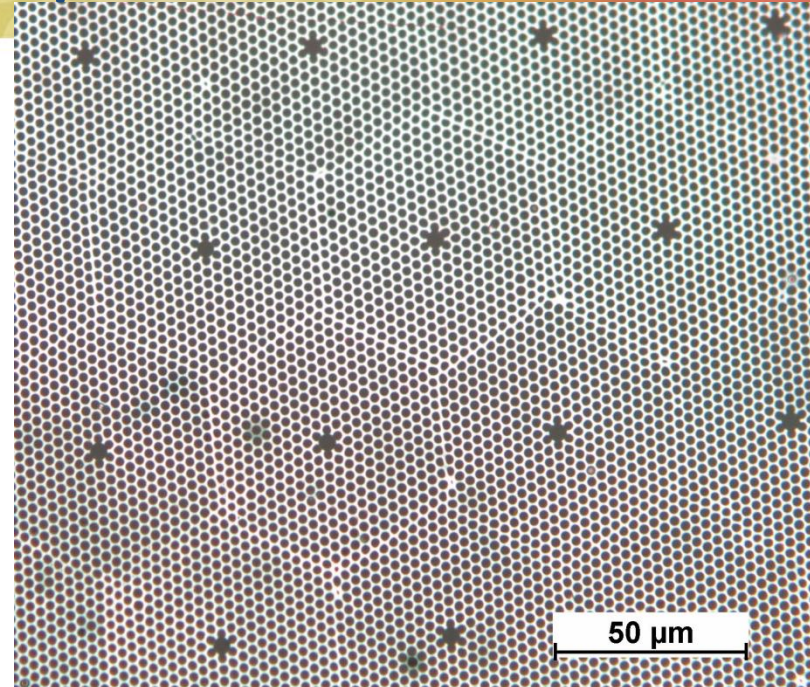


Other Capillary Developments

Photonic Bandgap Accelerator

SBIR/STTR

- Collaboration with Stanford Linear Accelerator
- Top Image: $2\mu\text{m}$ capillaires with $4\mu\text{m}$ center 'defect' (ET3509)
- Bottom Image: Cudos Simulation shows the uniform longitudinal accelerating field in the central defect together with a hexagonal array of surrounding hot spots (SLAC-PUB-14440)





Bright Ideas in Fiberoptics

Related Work: CMP Trials for <250 μm Thicknesses

Samples sent to vendor for evaluation

- 4" x 4" x 0.078" 20 μm capillary plates
- 4" x 4" x 0.078" 20 μm solid-core plates

Target thickness: 100 μm

To be applied to 10 μm and 2 μm capillary plates