SAND2015-6747C

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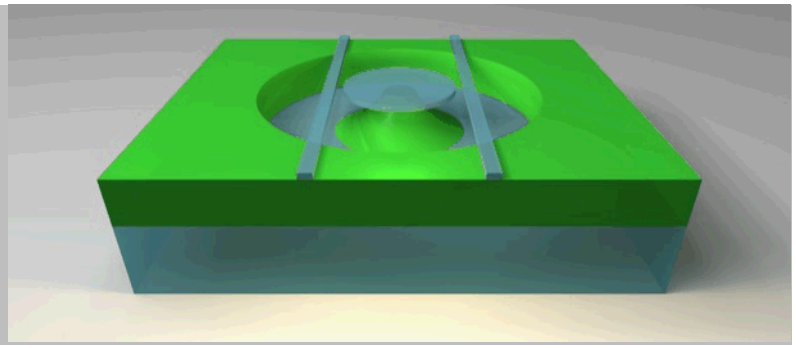

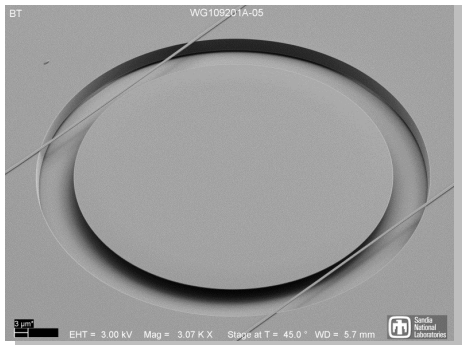

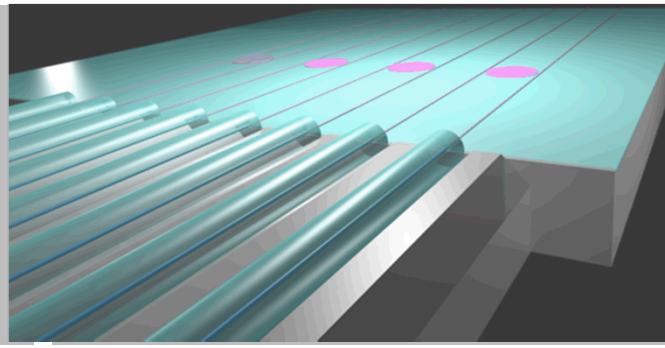

Micro-systems for Scalable QKD Components Achievements & Progress

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U.S. DEPARTMENT OF ENERGY | NNSA National Nuclear Security Administration

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Sandia Efforts

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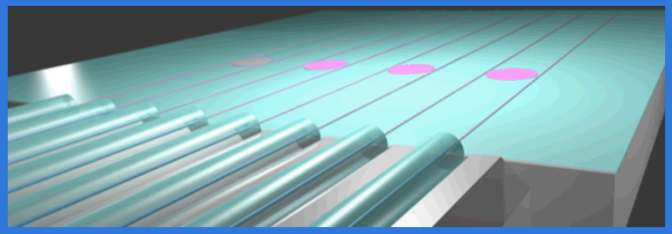
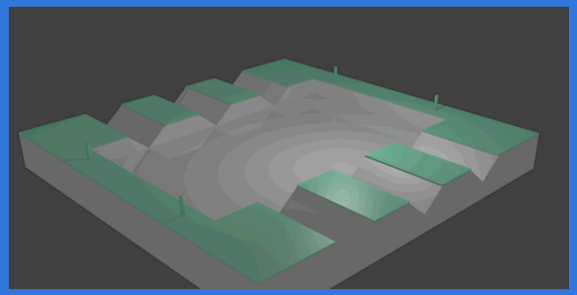
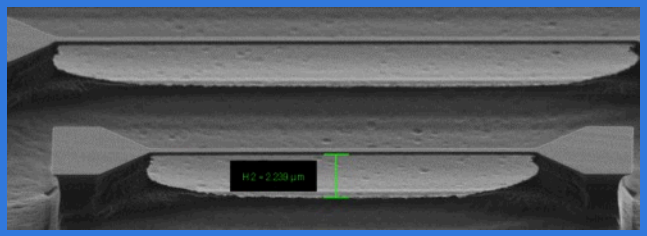
Demonstrate efficient (-1 dB) fiber – to – chip-to-fiber coupling, enabling quantum integration applications.



Develop simplified, scalable kinematic alignment techniques.



Develop targeted, deterministic ion implantation in diamond substrates. Supporting: Loncar, Englund, and Waks.



Deliver high quality, packaged, integrated resonators to Northwestern and UMBC teams.

Efficient Fiber-to-chip Coupling

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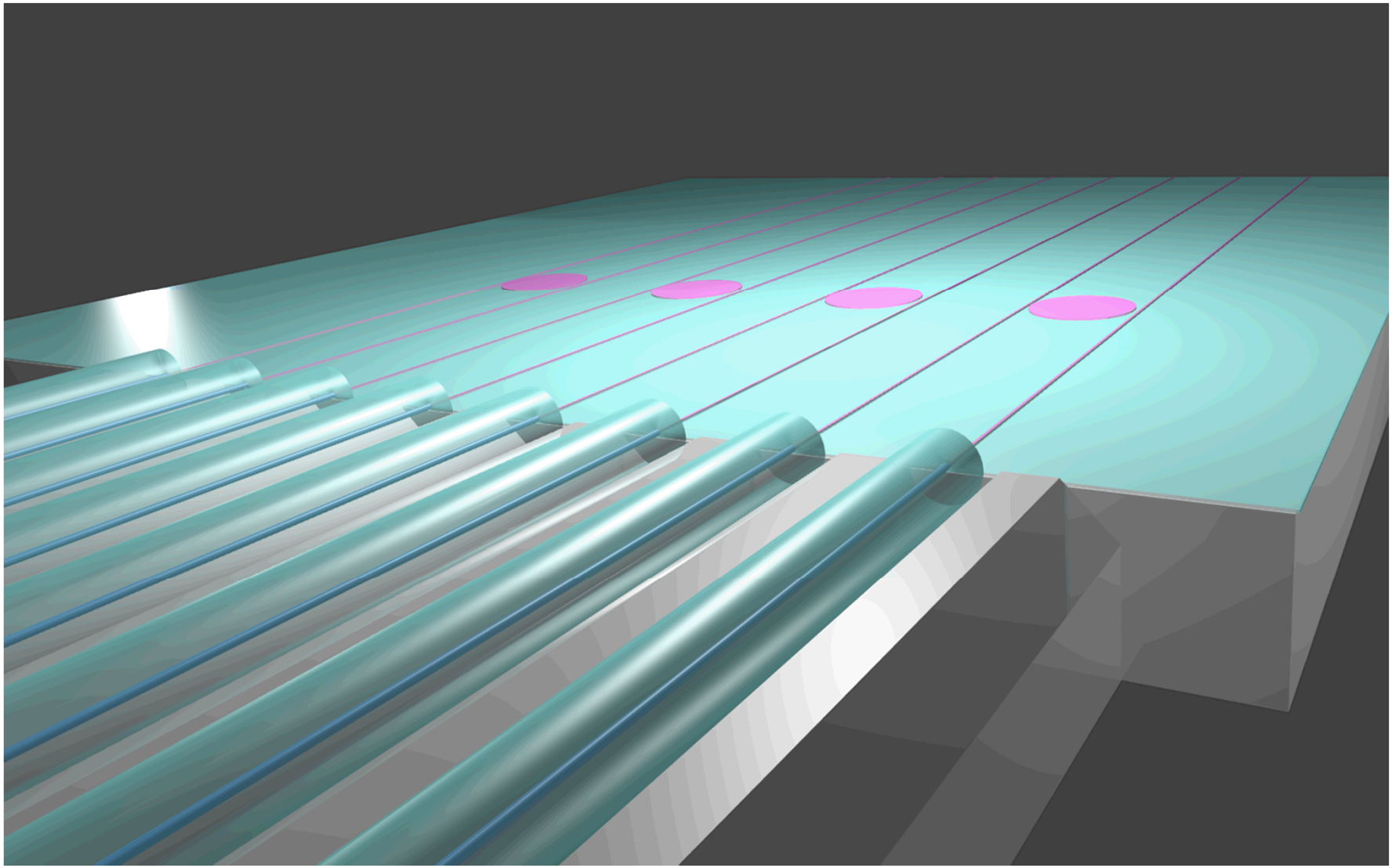
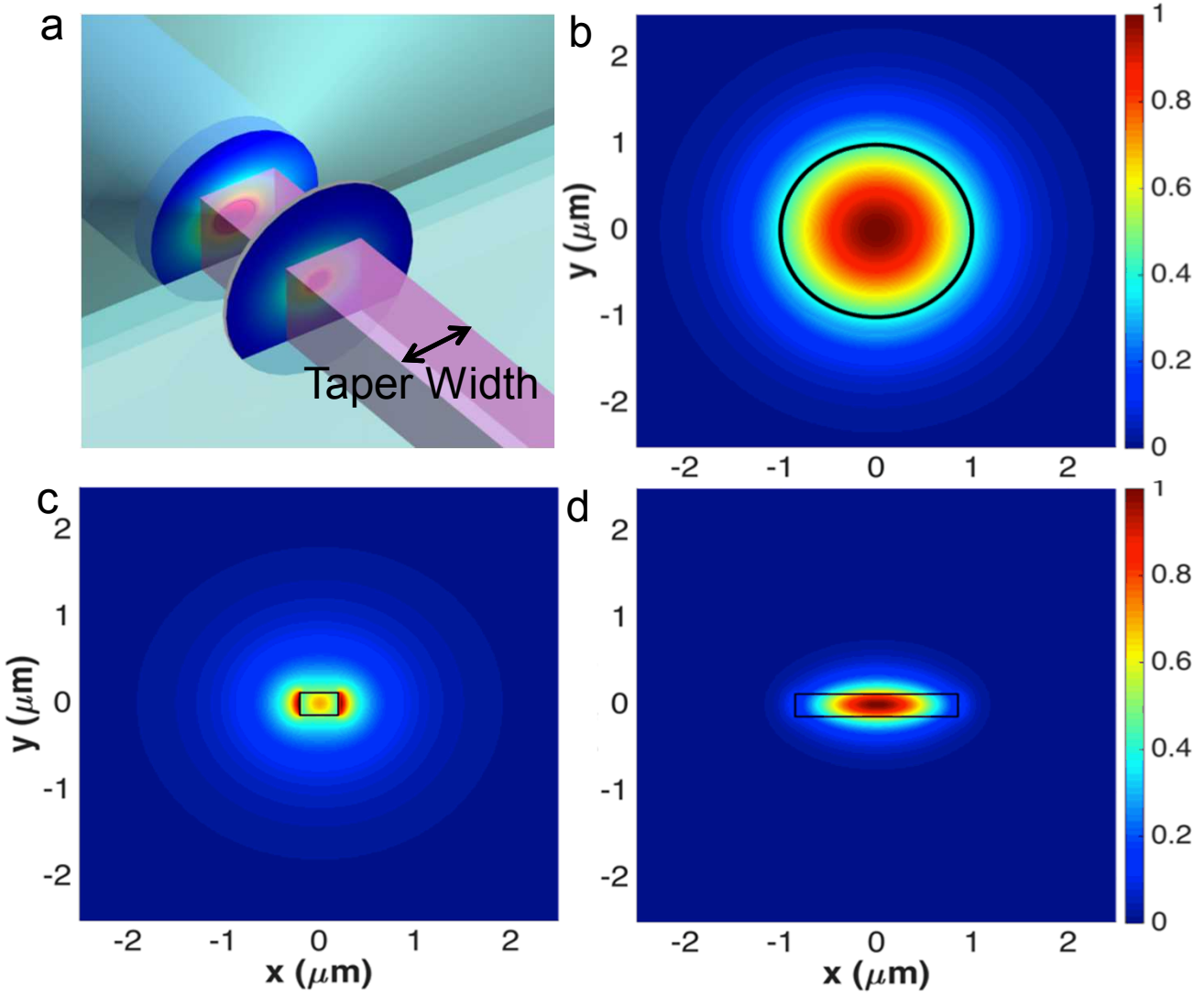


The problem & solution



Advances in Fiber-to-chip coupling

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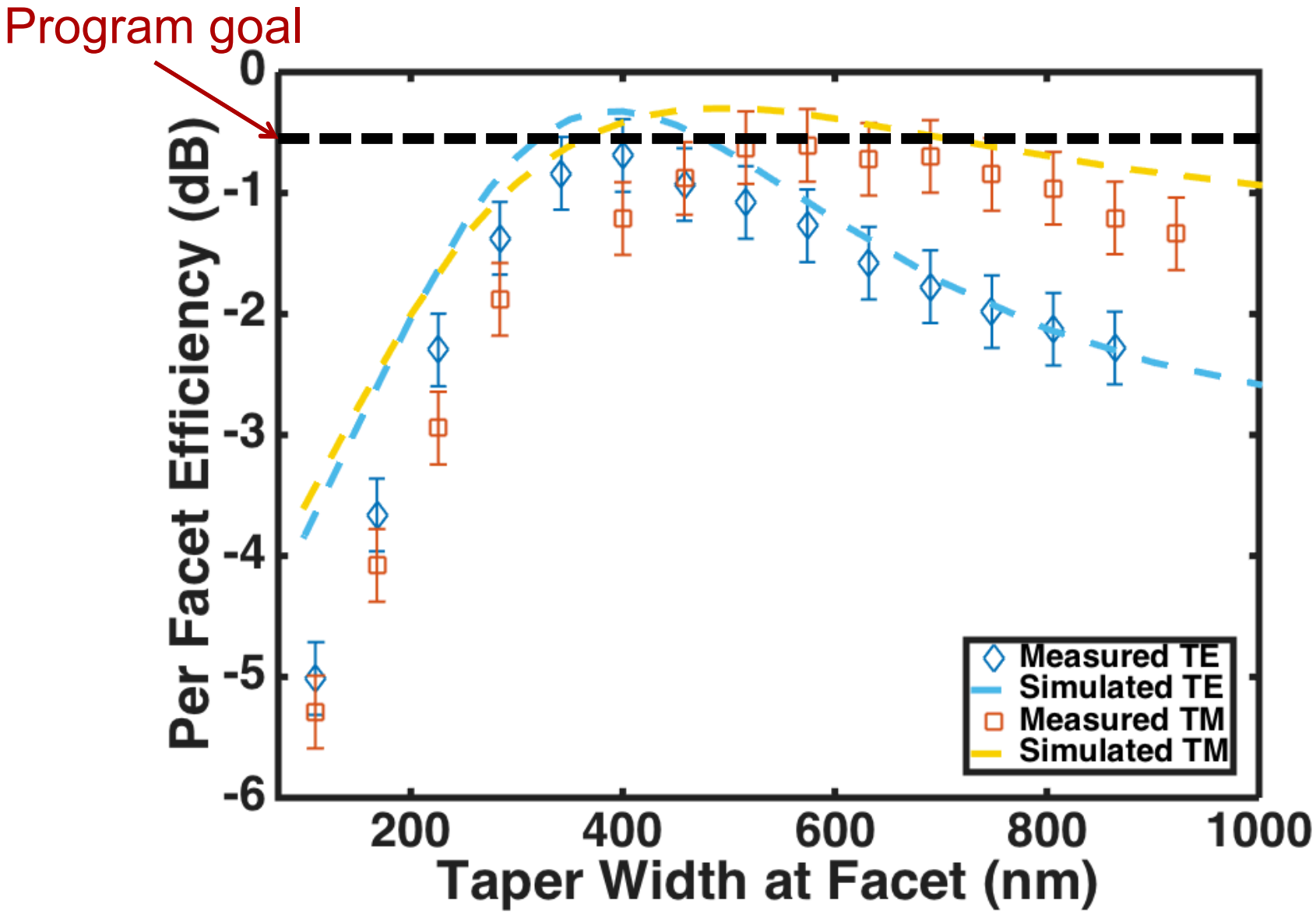
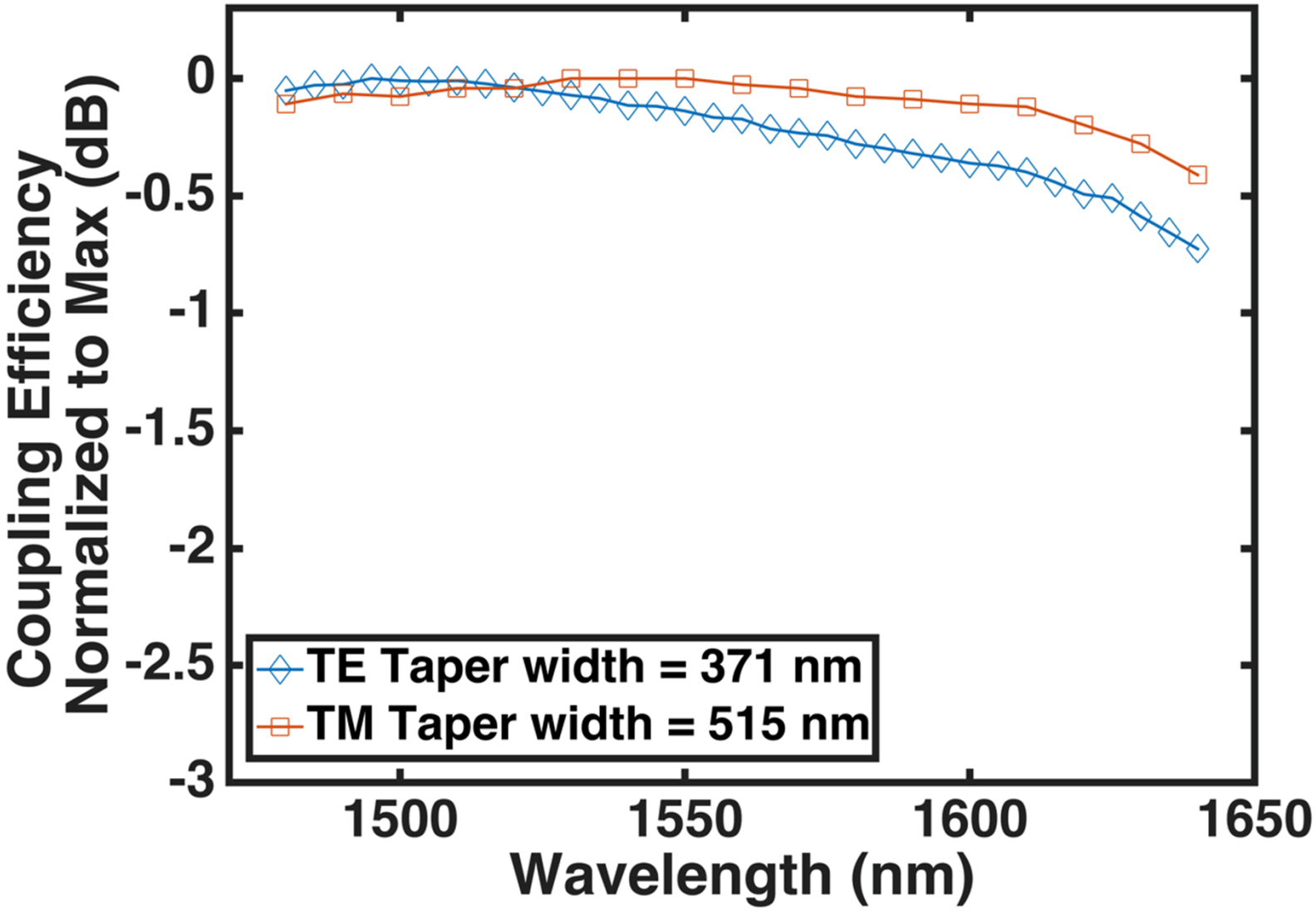
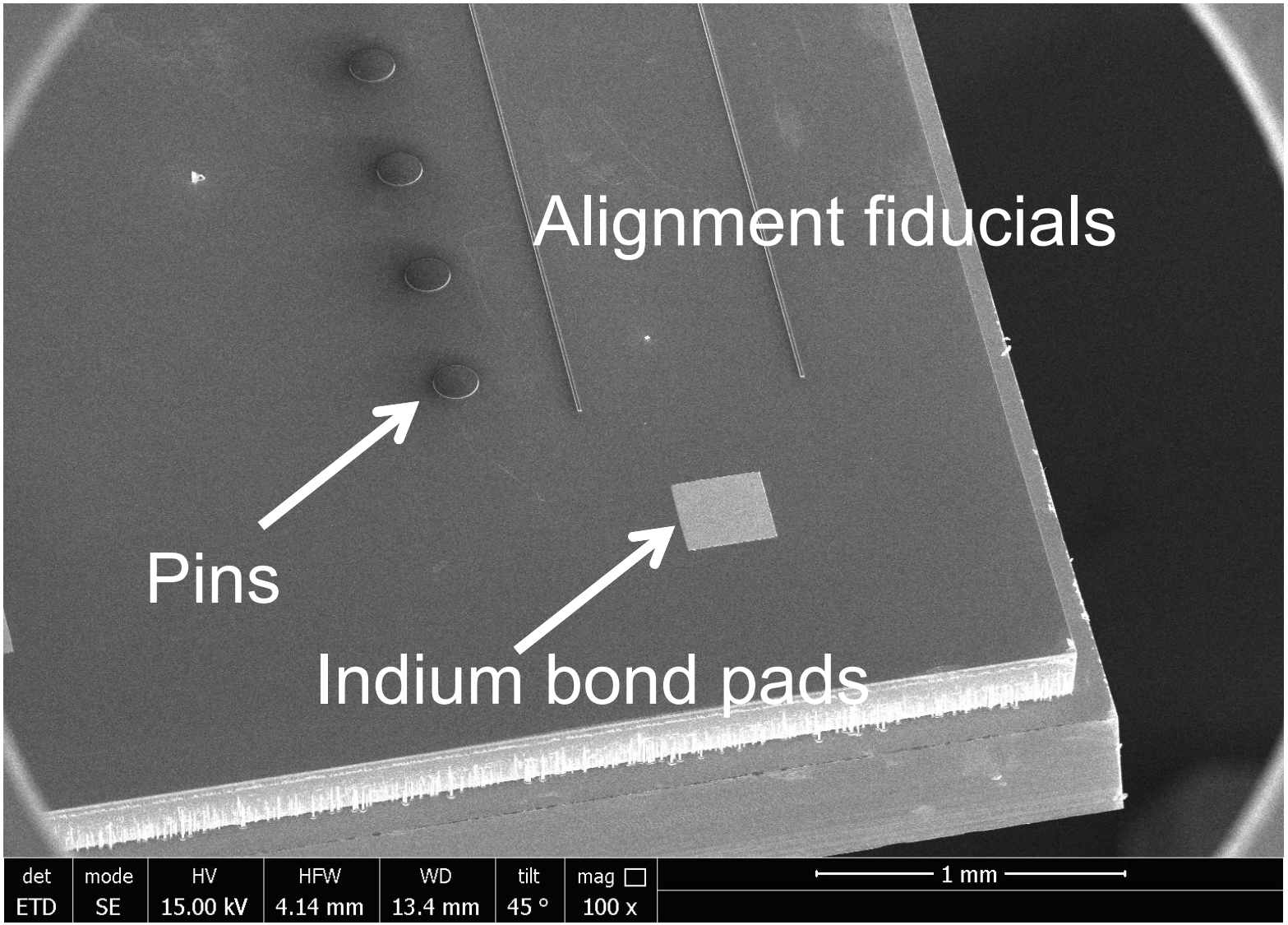


Bandwidth and multiple facets

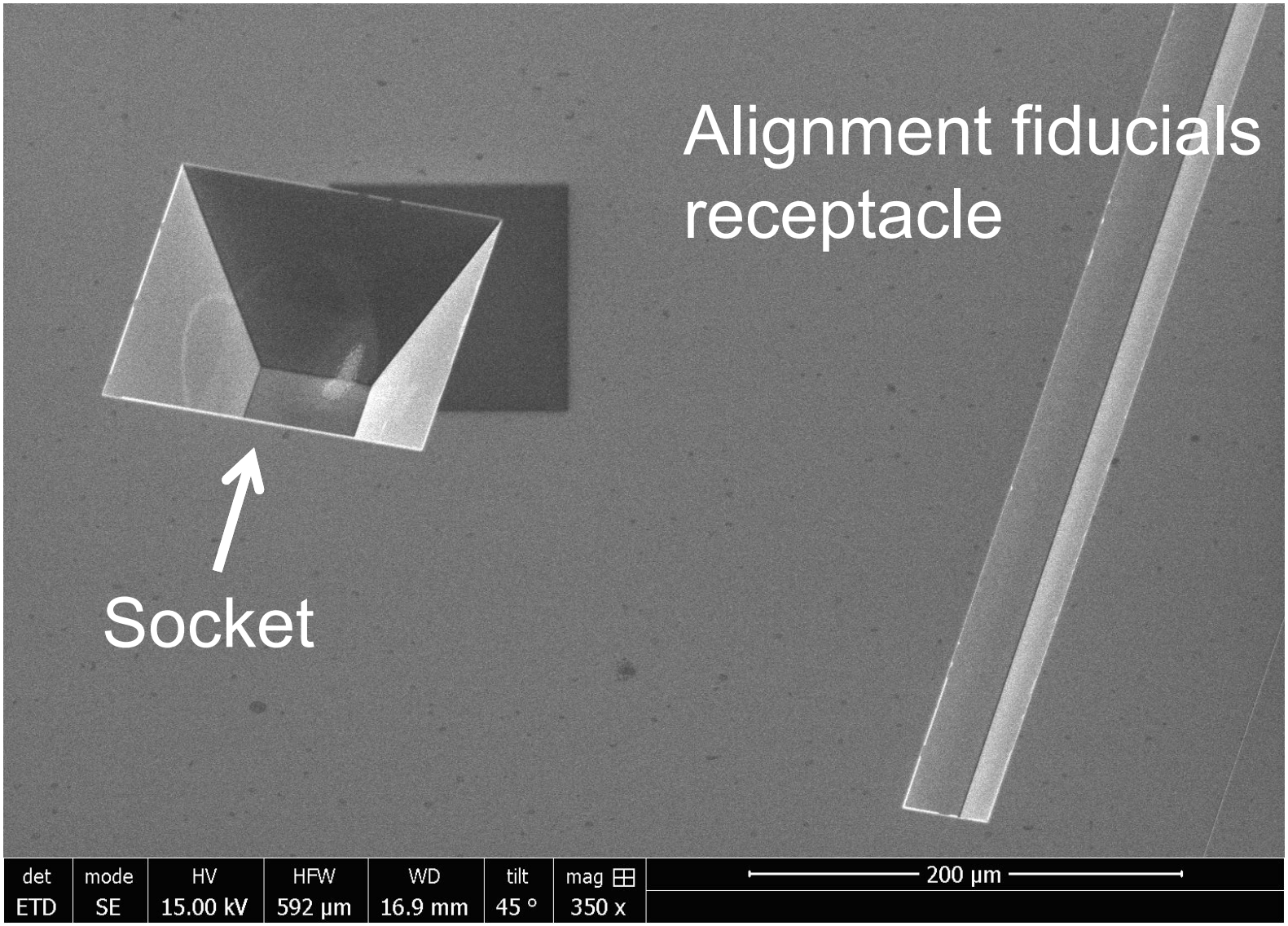


Kinematic Alignment Efforts

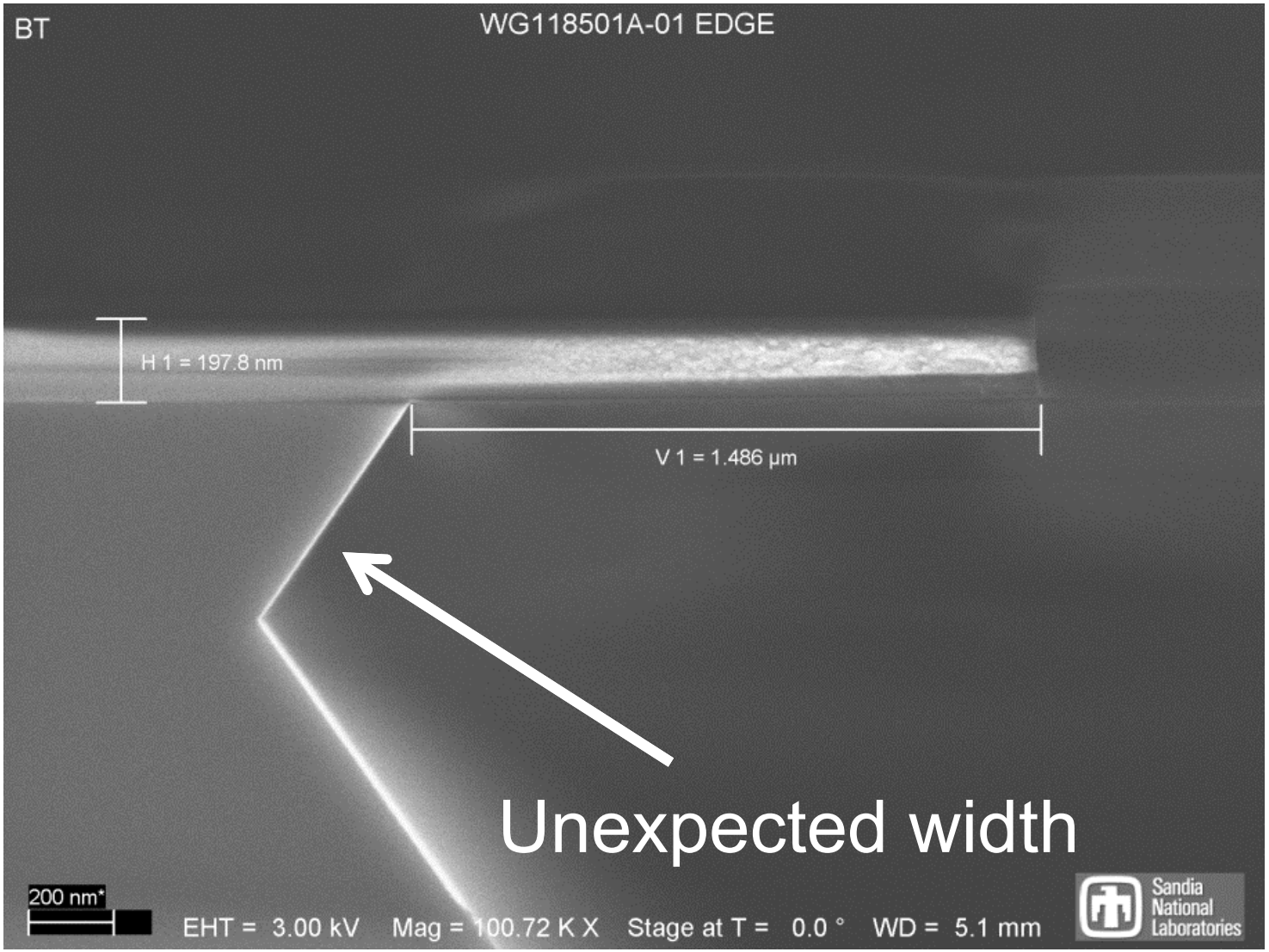
Our Components



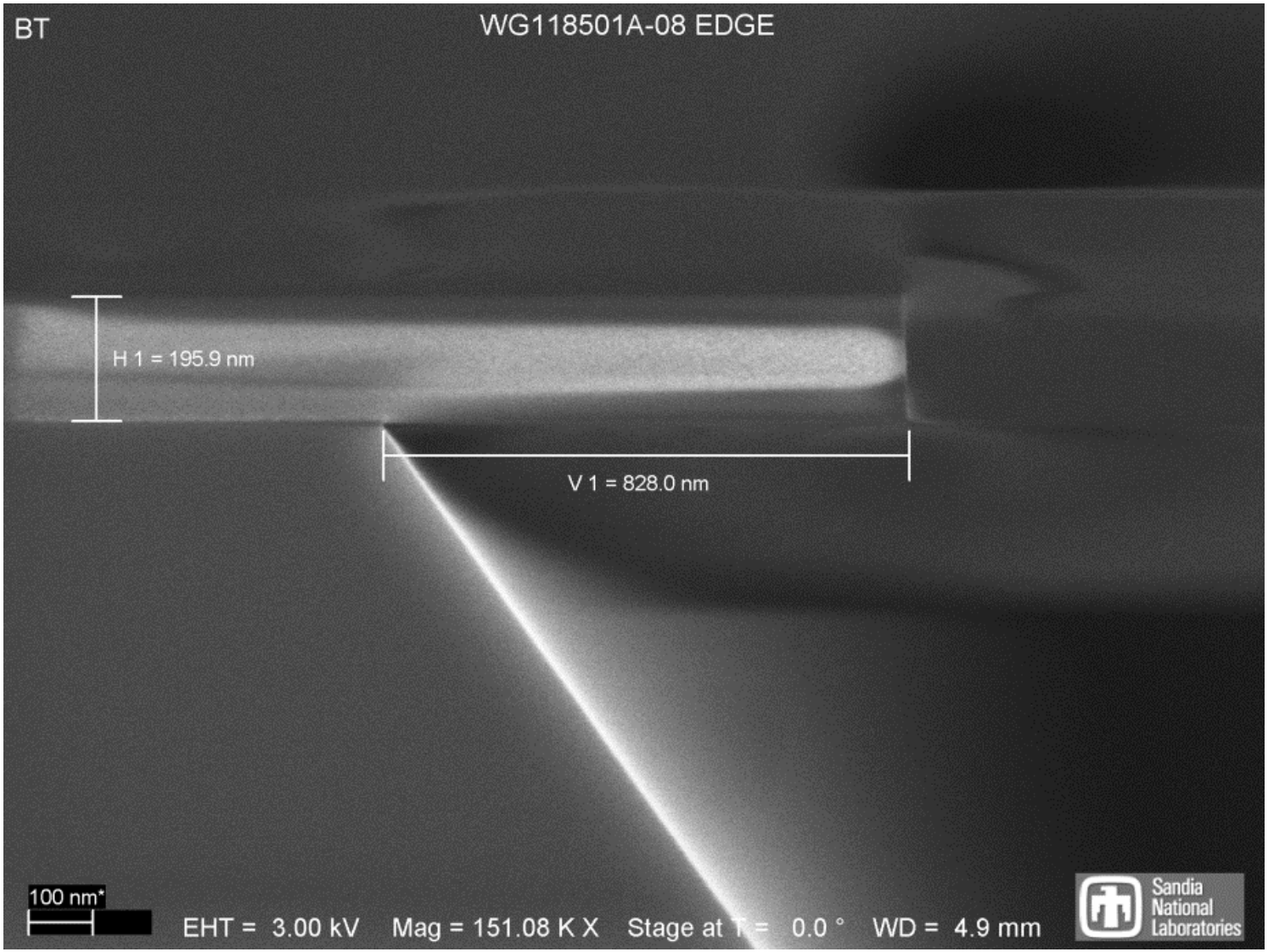
Our components II



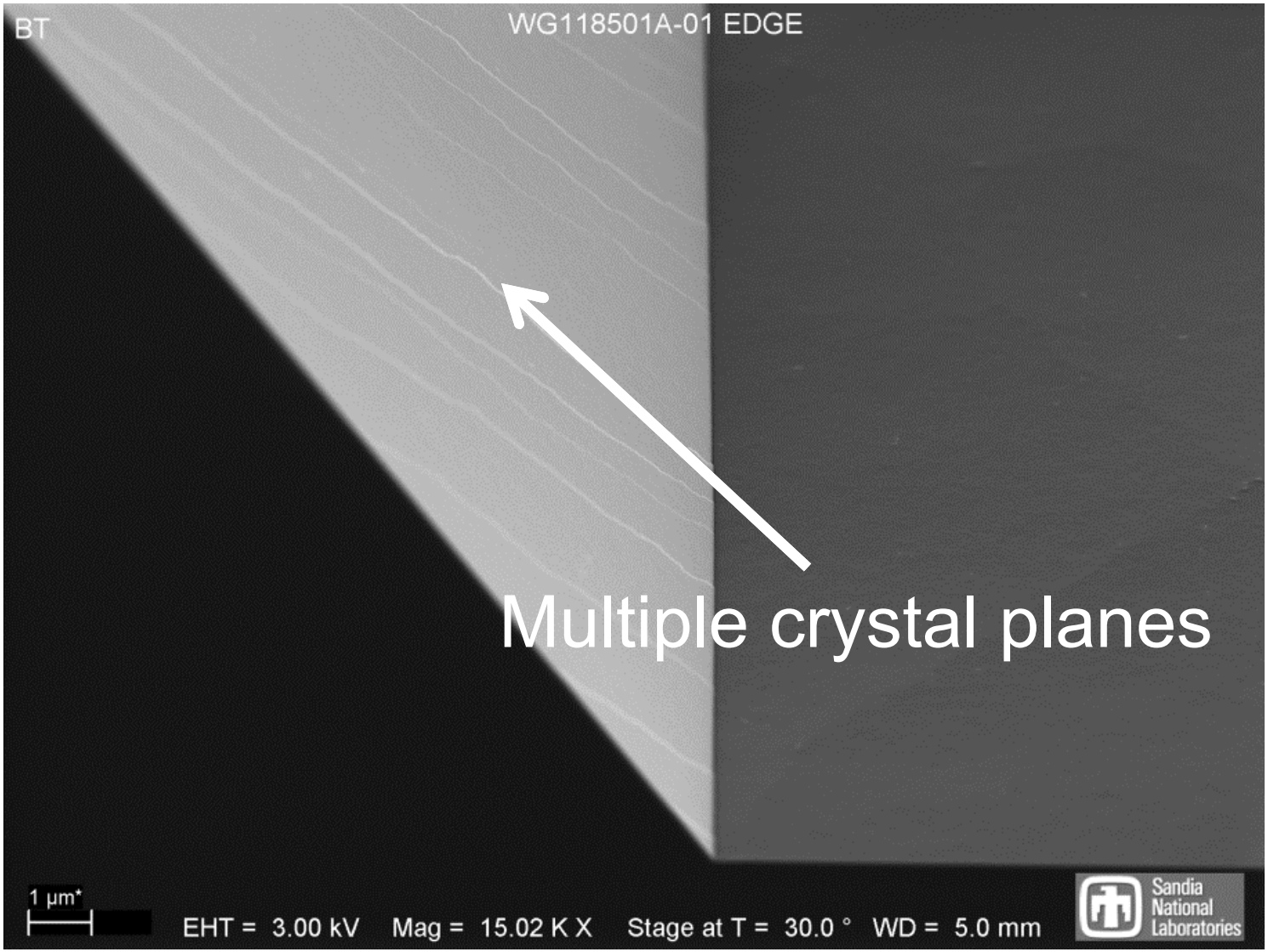
An example of the fab challenges



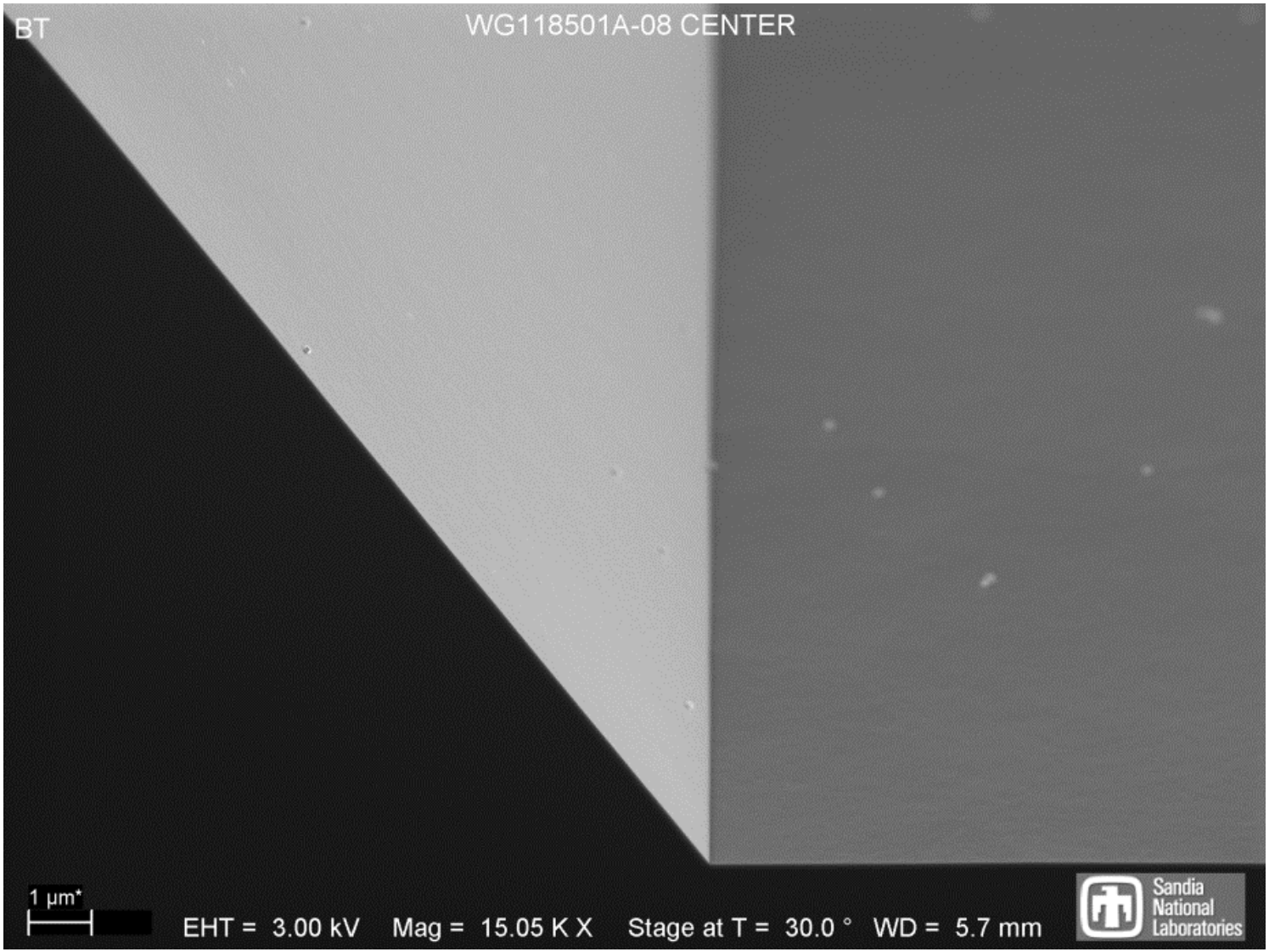
An example of the fab challenges



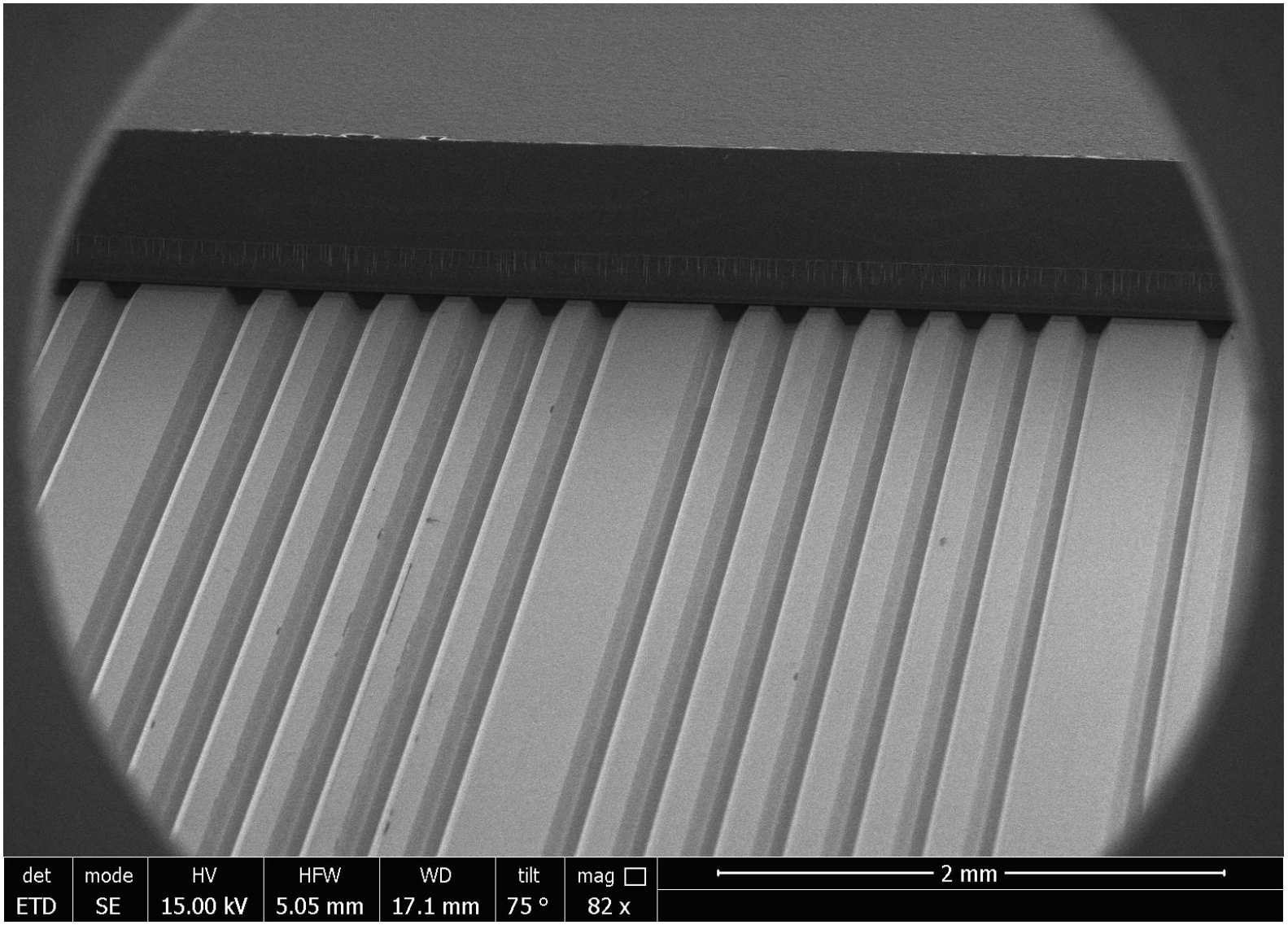
An example of fab challenges



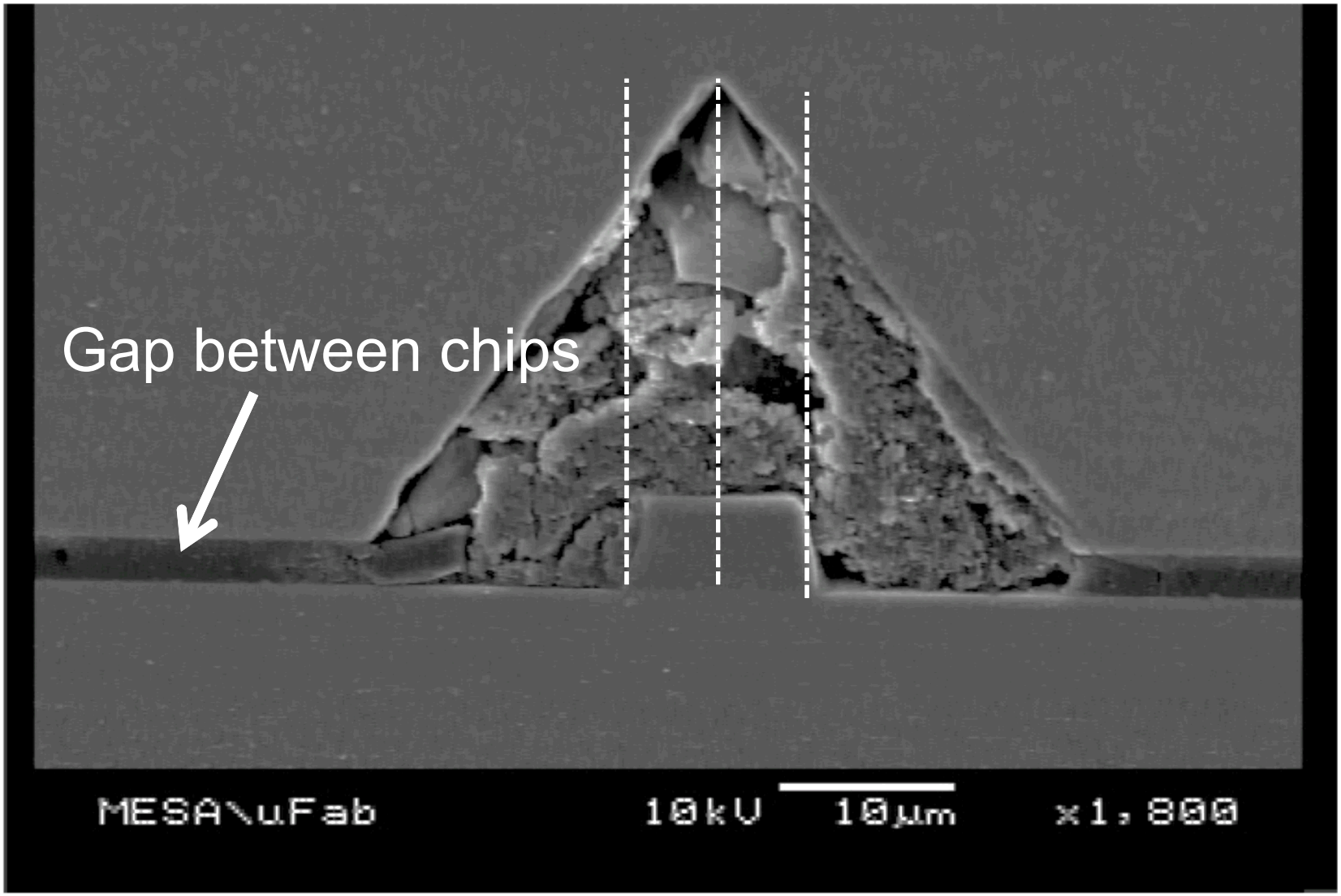
An example of fab challenges



Bonded Chips



How close are we?



Coupling with 1-axis micrometer

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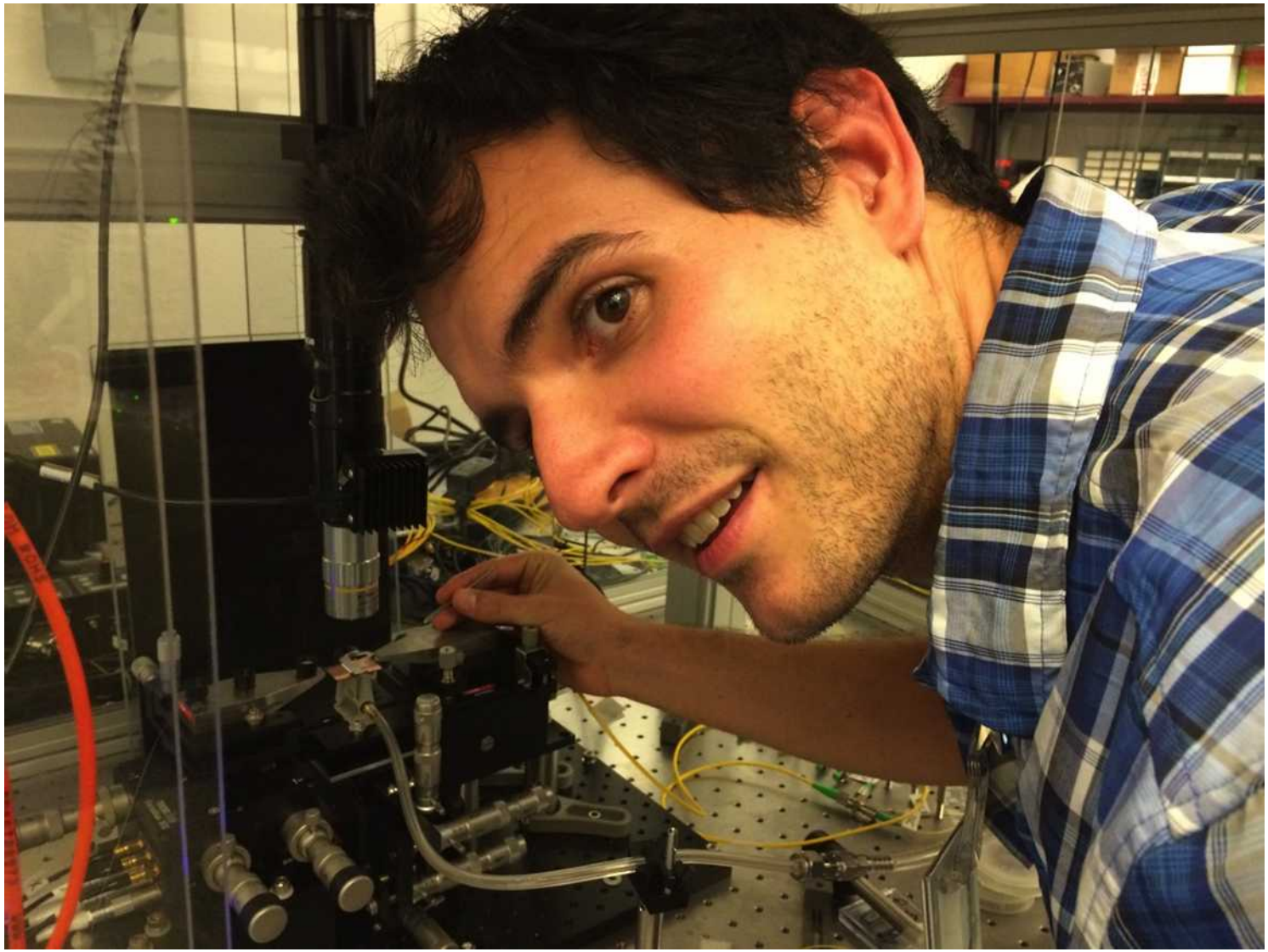
- First generation chips: adjustments will be made to process to nail down alignment.
- Typical numbers: 1.5-2 dB/facet turning one knob → Program goal!
- High variability due to fabrication issues – Solvable!

Have video through microscope of fiber moving in and out of socket – will be added when available

By hand?



By hand?

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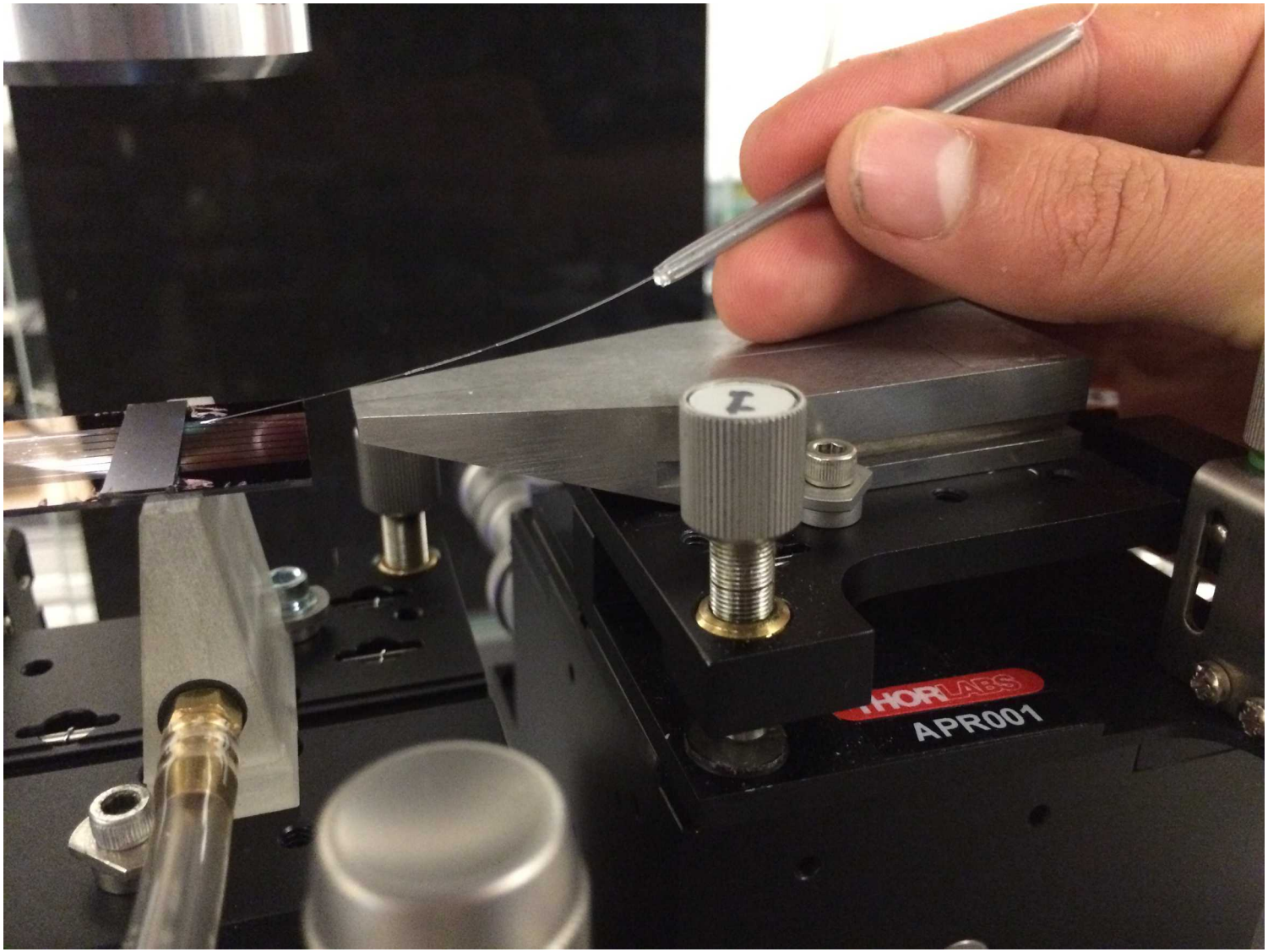
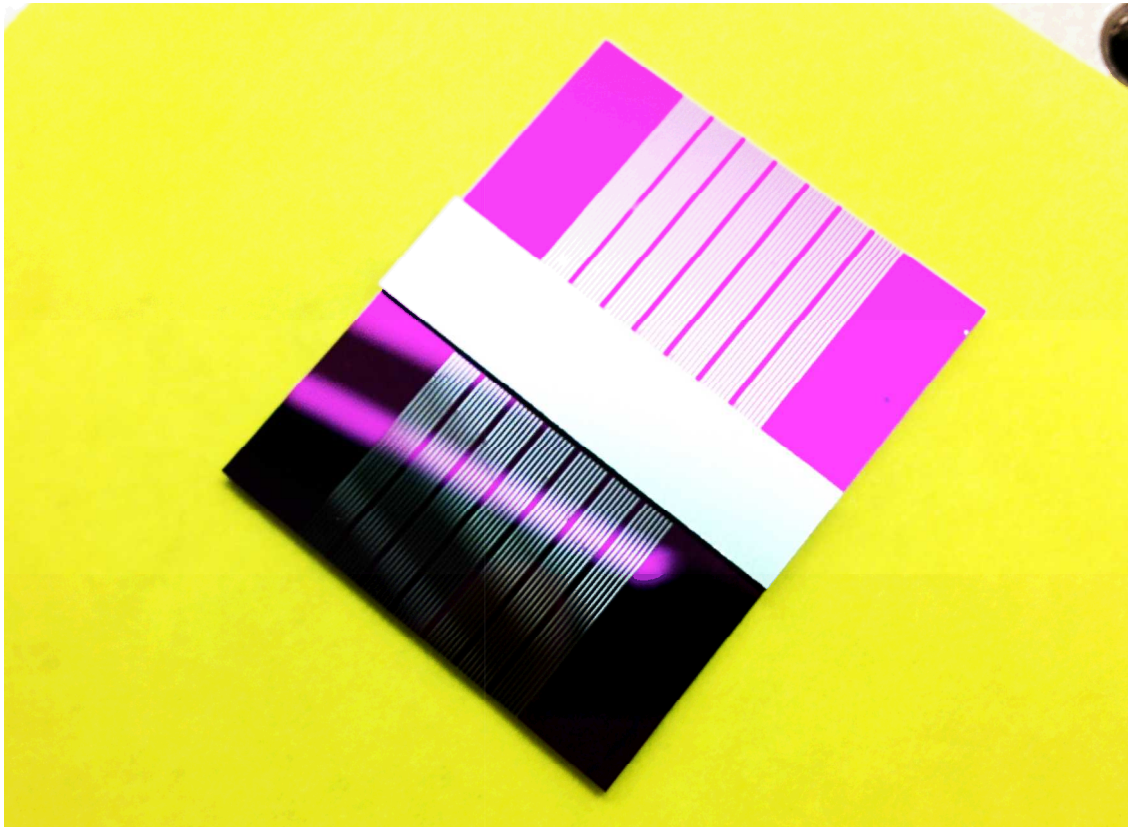
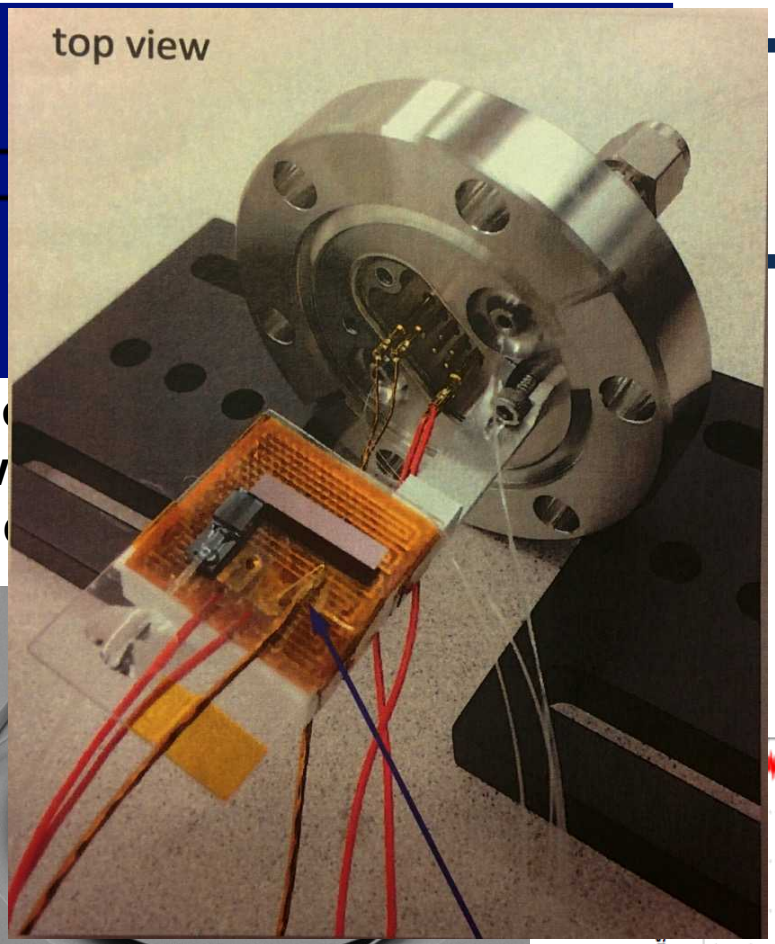


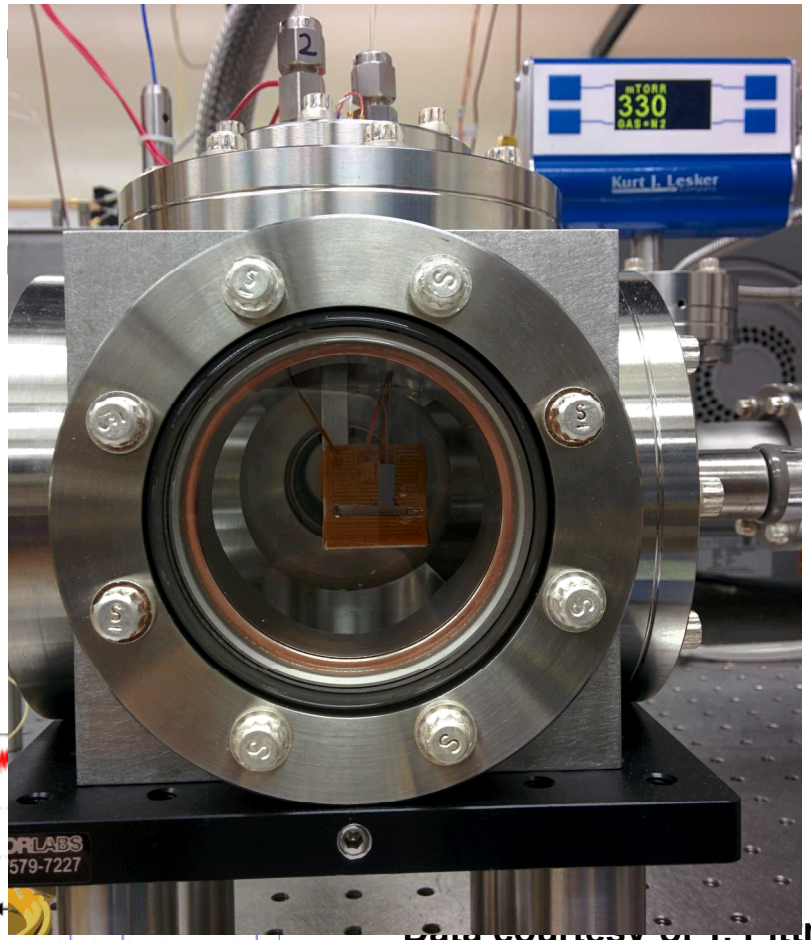
Next steps…

- Improve fabrication yield
- Develop spring-loaded components for stability – think FC coupler.



Devices for UMBC
Phase shifting micro-disks





Use
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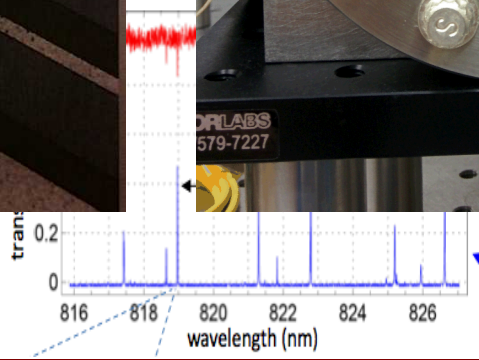

Data courtesy of T. Pittman