

Correcting Hohlraum Drive Asymmetry with Glow Discharge Polymerization Coated Capsule Shims

M. Ratledge¹, E. Del Rio¹, B. Watson¹, N. Said¹, N. Rice¹, M. Farrell¹, E. Dewald², A. Nikroo², and D. Clark²

¹General Atomics, P.O. Box 85608, San Diego, California 92186-5608

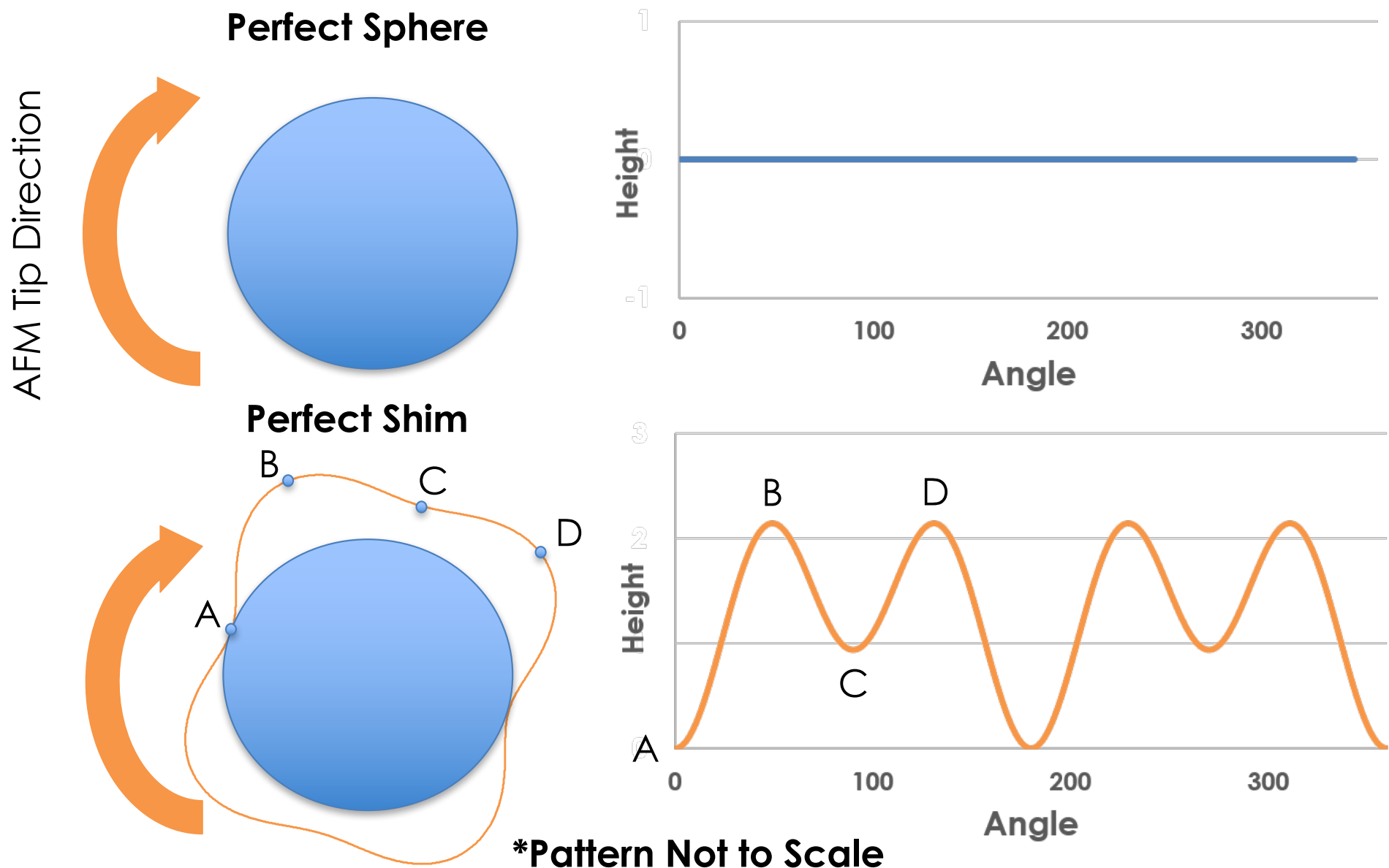
²Lawrence Livermore National Laboratory, P.O. Box 808,
Livermore, California 94550

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April 23-26, 2019

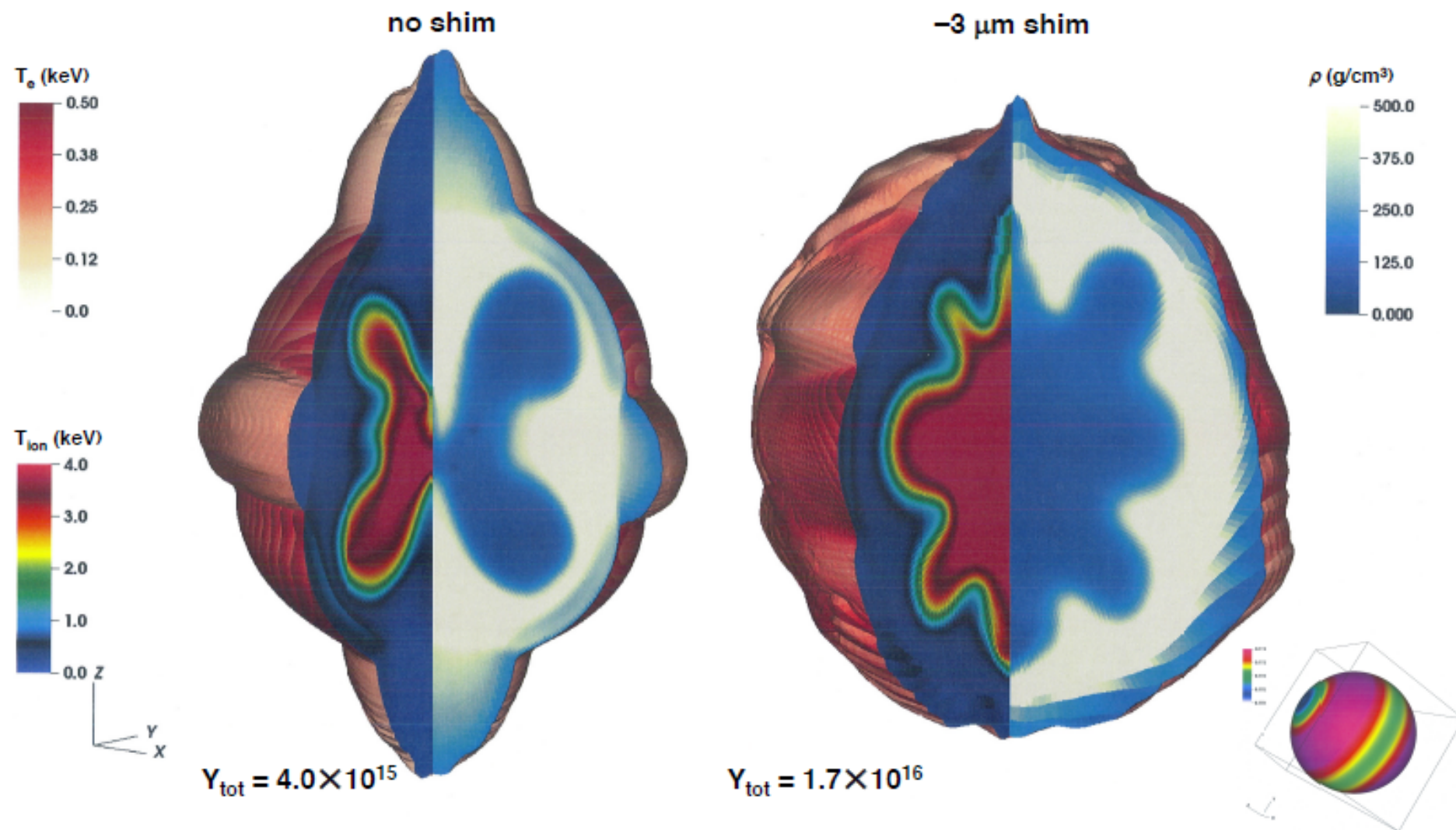
Overview

- **Motivation**
 - Shim background and Machining Method
- **Coating Experiments**
 - Planar Setup
 - Rotational Setup
 - “Donut” Setup

Rotational AFM traces are used to determine success of the P4 Legendre mode shim

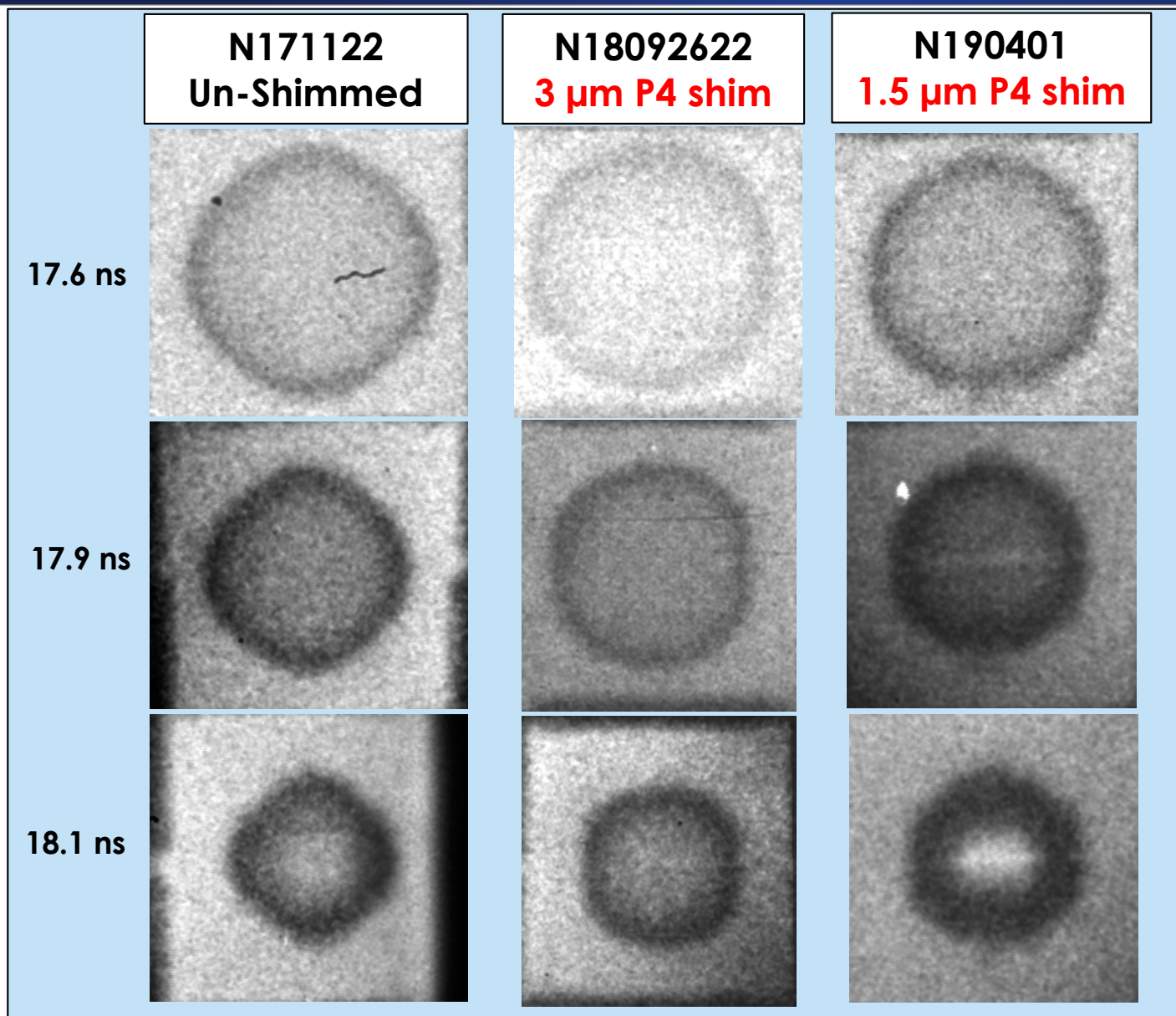


Simulations have shown shimming the capsule with extra mass in discrete locations can improve implosion shape



D. Clark "Shim Update" P₄ Working Group, Feb. 17, 2017

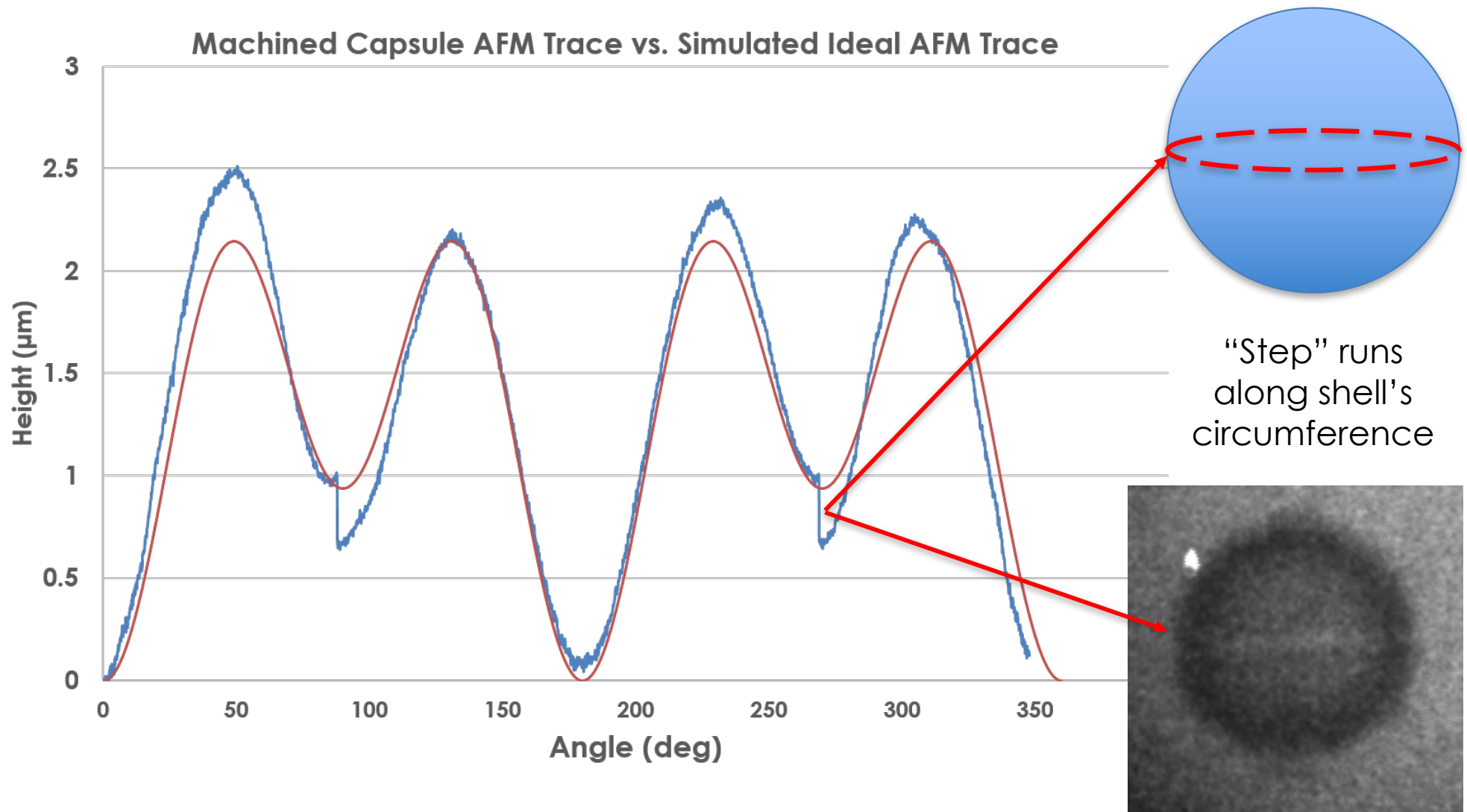
Machined capsule 2DConA shots confirmed simulation – shims improved the implosion shape



- **N171122: +10 μm (control)**
- **N180926: -10 μm (overcorrection)**
- **N190401: $\pm 0\mu\text{m}$**

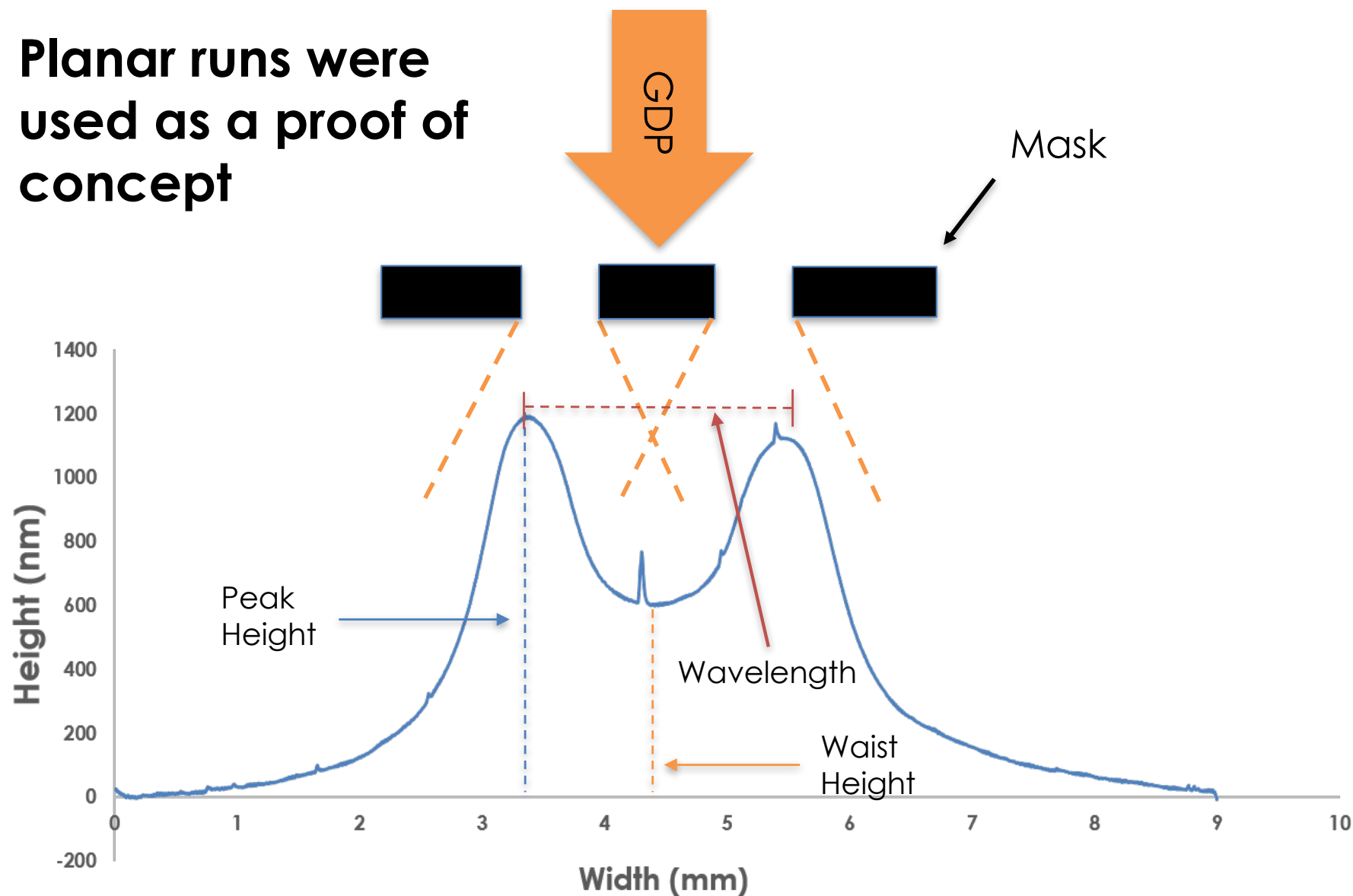
D. Clark and E. Dewald
"I_Int_2DConA_Shim_S02_N18092
6 NIF Performance Review", Oct.
18, 2018

Machined P4 shim step defect not ideal for DT implosion

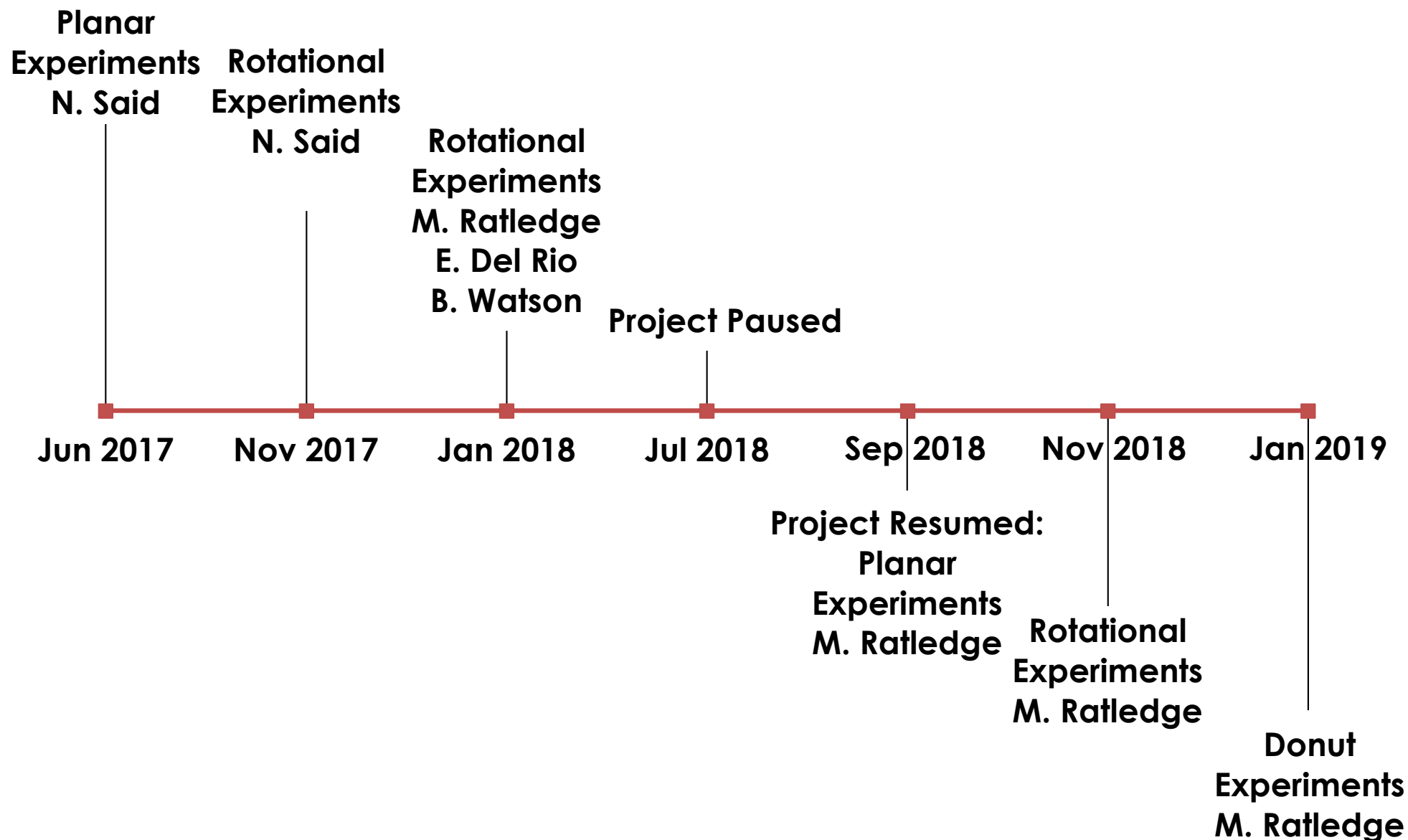


Coat GDP through a mask to constructively generate the shim pattern

- Planar runs were used as a proof of concept

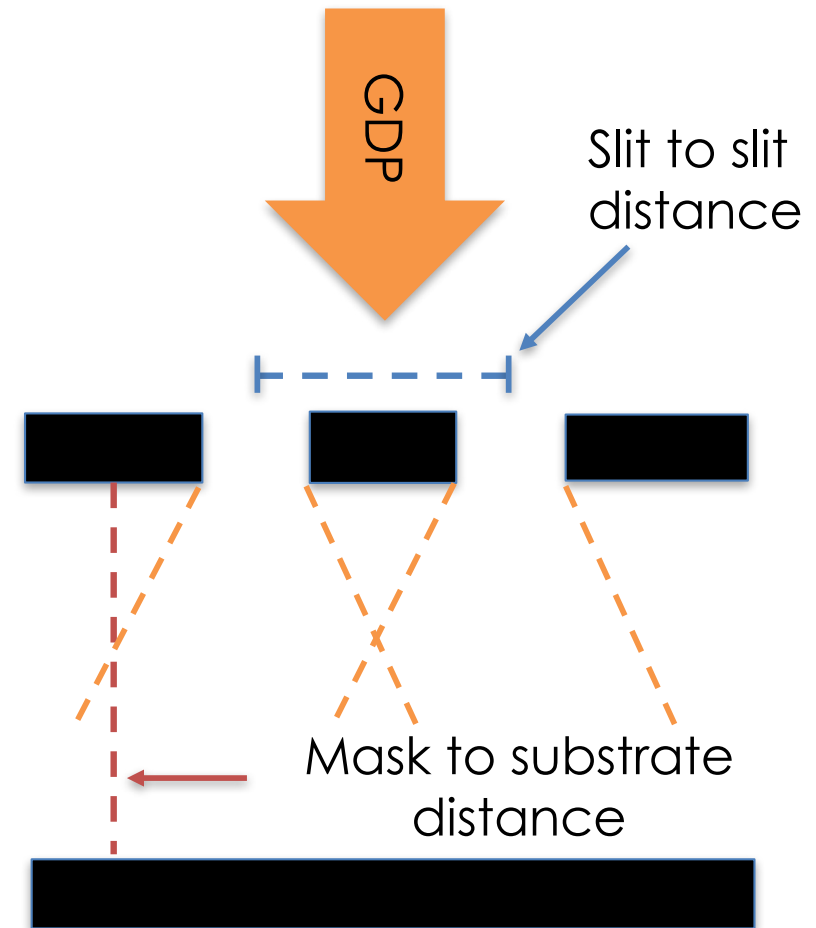


Coating capsule shims has been an ongoing project with many contributors



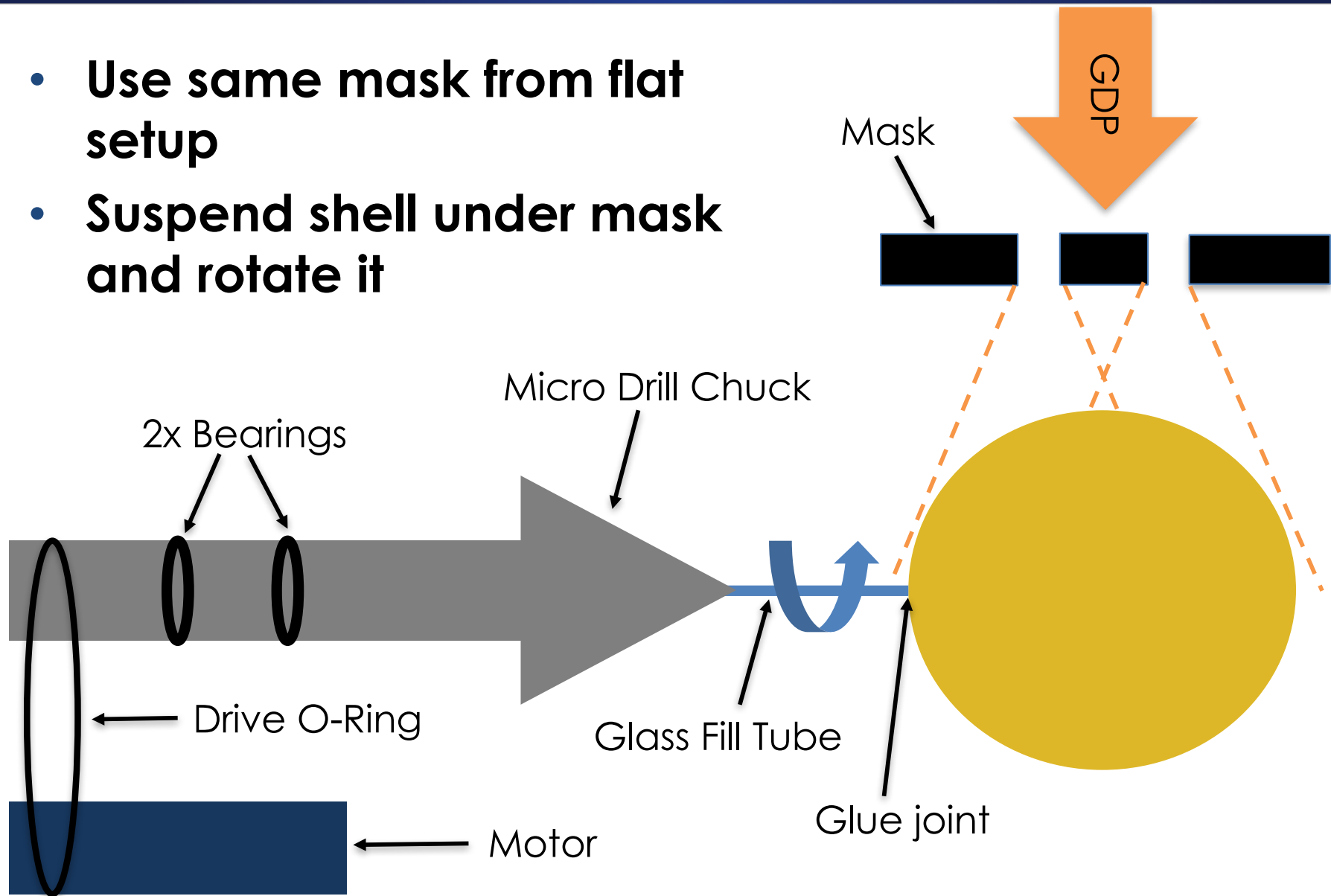
Planar experiments provided insight for future spherical experiments

- **Increase mask to substrate distance**
 - Waist:peak ratio increases ↑
 - Wavelength increases ↑
- **Increase slit to slit distance**
 - Waist:peak ratio decreases ↓
 - Wavelength increases ↑
- **Increase coating time**
 - Waist: peak ratio stays within 5% =
 - Wavelength stays constant =



Motor-driven micro drill chuck is used to rotate shell under coating mask

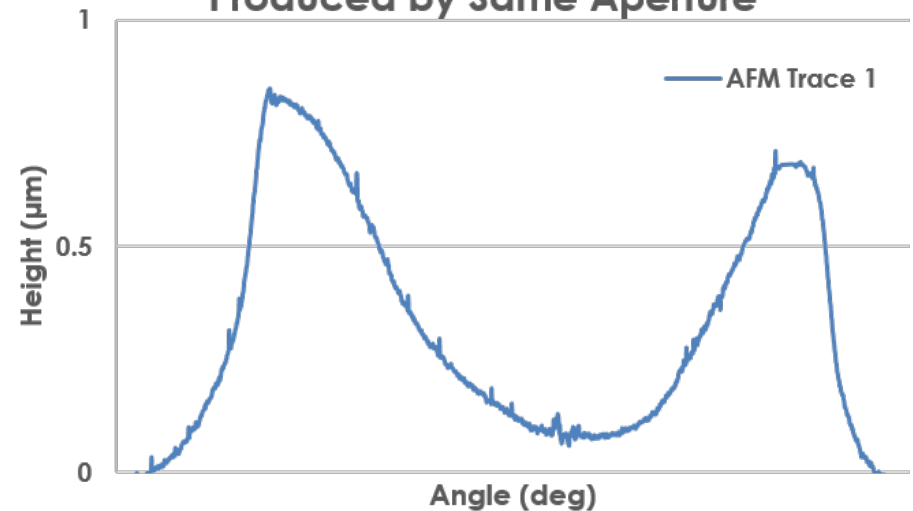
- Use same mask from flat setup
- Suspend shell under mask and rotate it



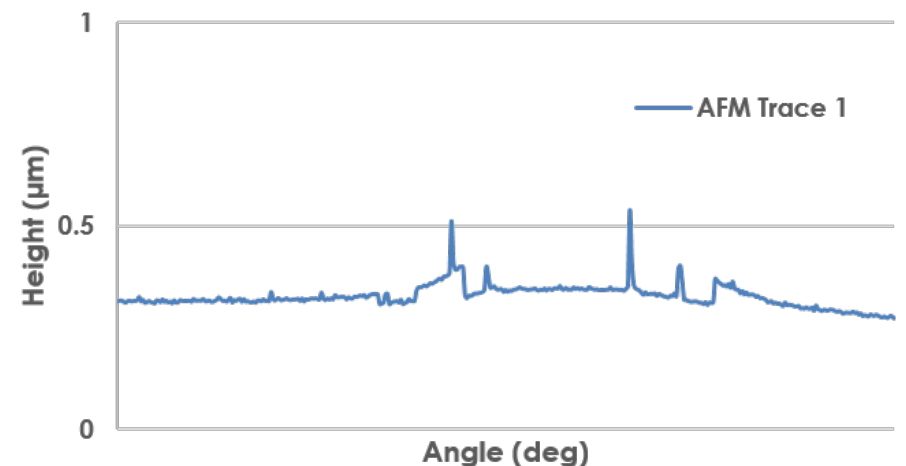
Rotational coating presents many inherent challenges

- **Rotational Wobble – many sources**
 - Shell to tube attachment**
 - Tube to drill chuck attachment**
 - Drill chuck
 - Bearings
- **Coating Coverage**
 - Avoid coating the glue joint
- **Low yield**

Wobble Effect: Opposing Peaks Produced by Same Aperture

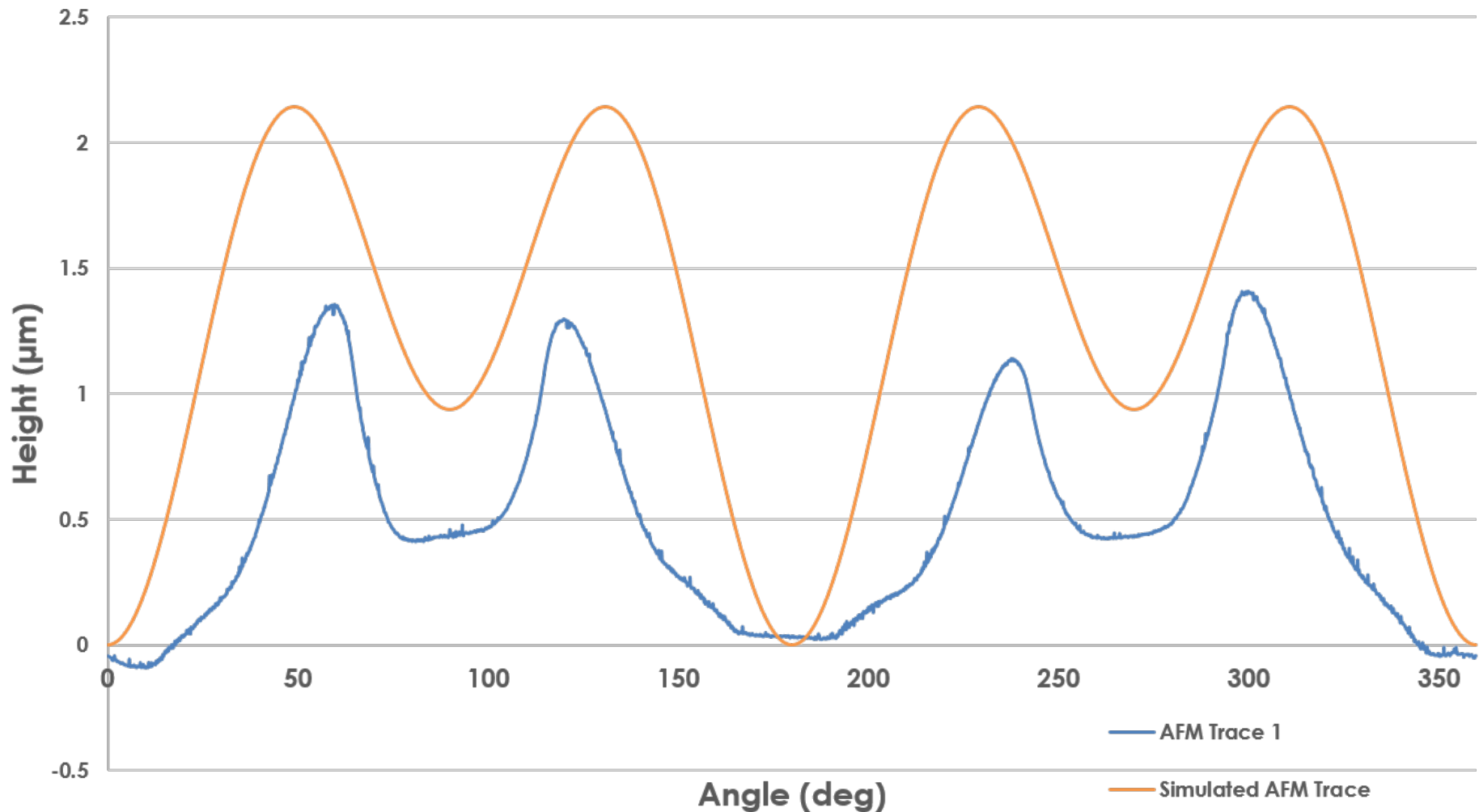


Coated Glue Joint After Tube Removal



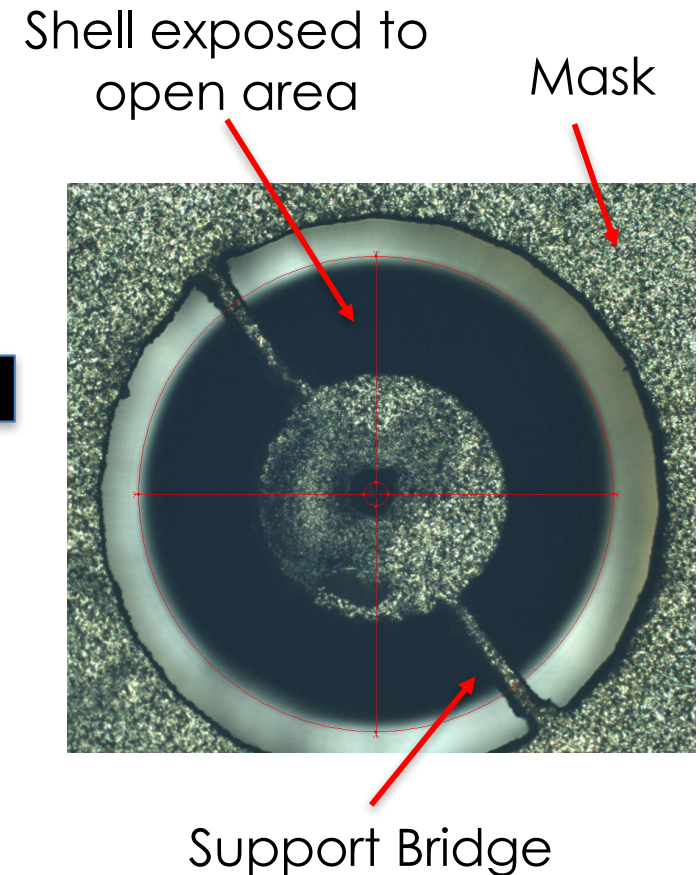
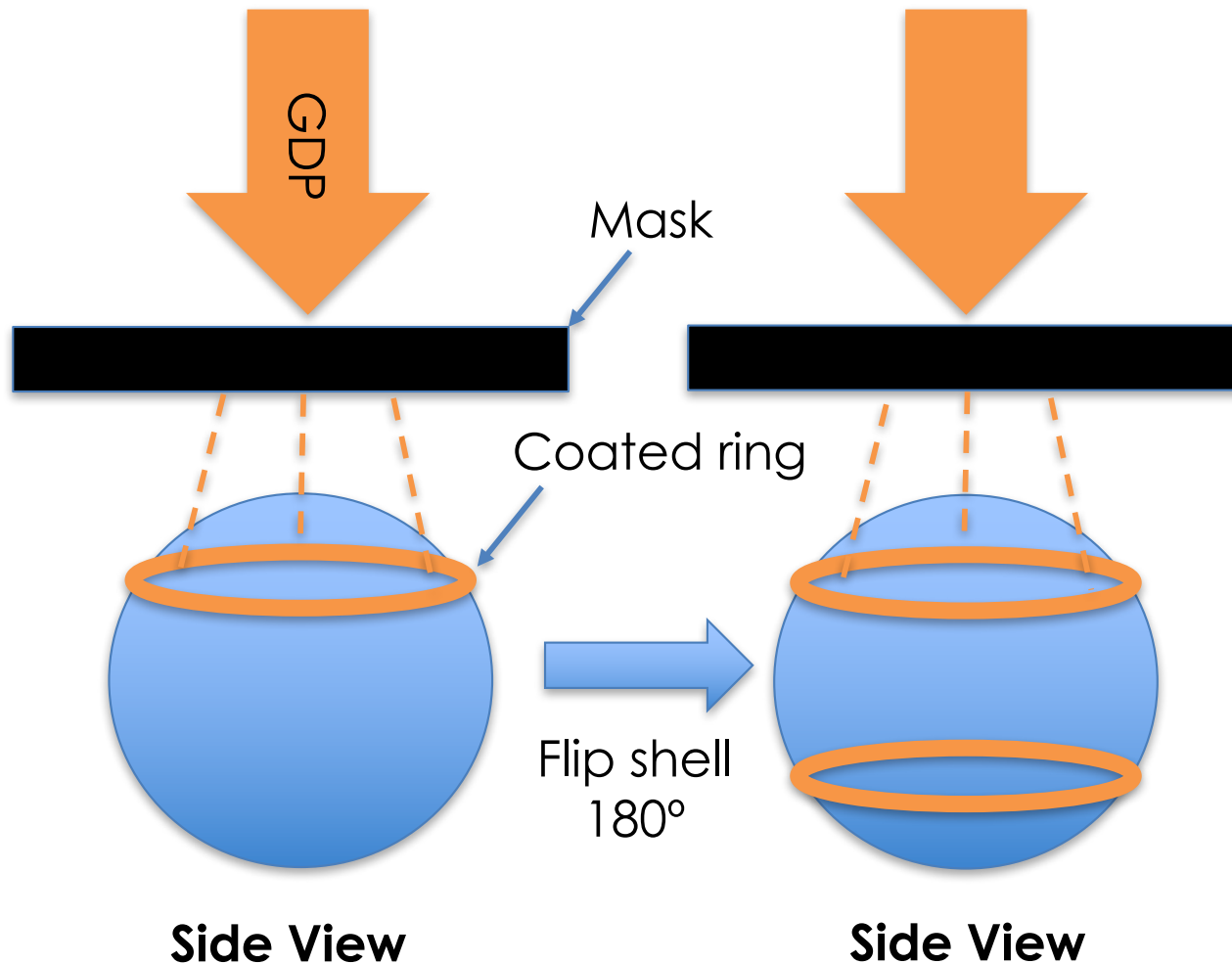
Rotational runs show promise, but wobble makes repeatable runs difficult

Rotational Setup AFM Trace vs. Simulated AFM Trace



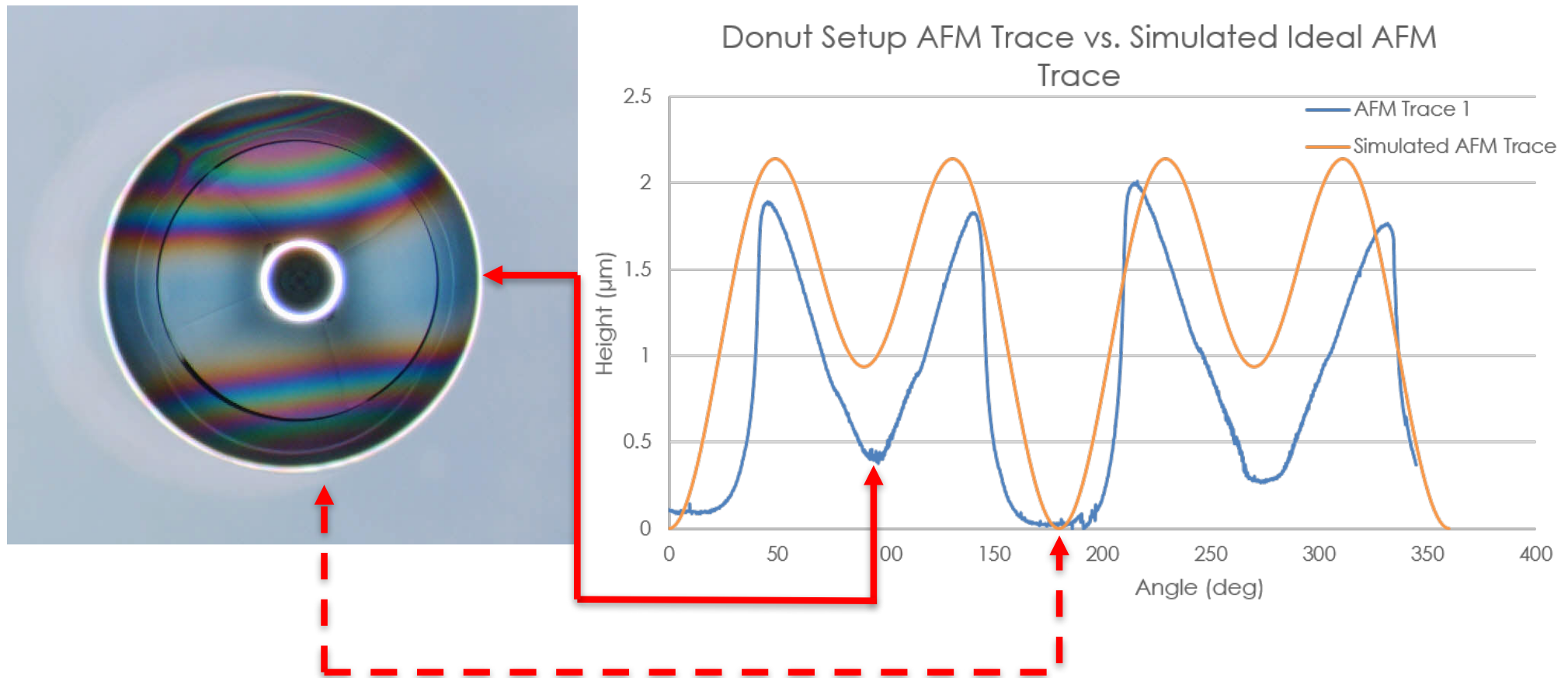
Donut setup is stationary and eliminates wobble from coating challenges

- Coat a ring on one side of the shell, flip it over, and repeat on the other side



Donut setup parameters are currently being studied to increase pattern agreement

- Challenge is to achieve more coating at the equator



Both capsule setups have advantages and disadvantages

- **Rotational Setup**

- Pros: Pattern agreement. Little to no defect on shell.
- Cons: Wobble not well controlled. Low yield.

- **Donut Setup**

- Pros: Setup ease. Stationary. Repeatable results.
- Cons: Potential mask bridge defects.

- **Next Steps**

- Improve pattern agreement
- Work on wobble if necessary

Questions?