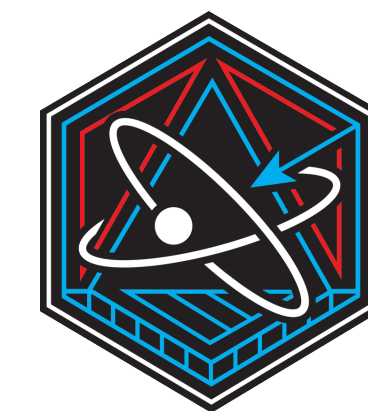


Machining Process for LANL Bosque Shells

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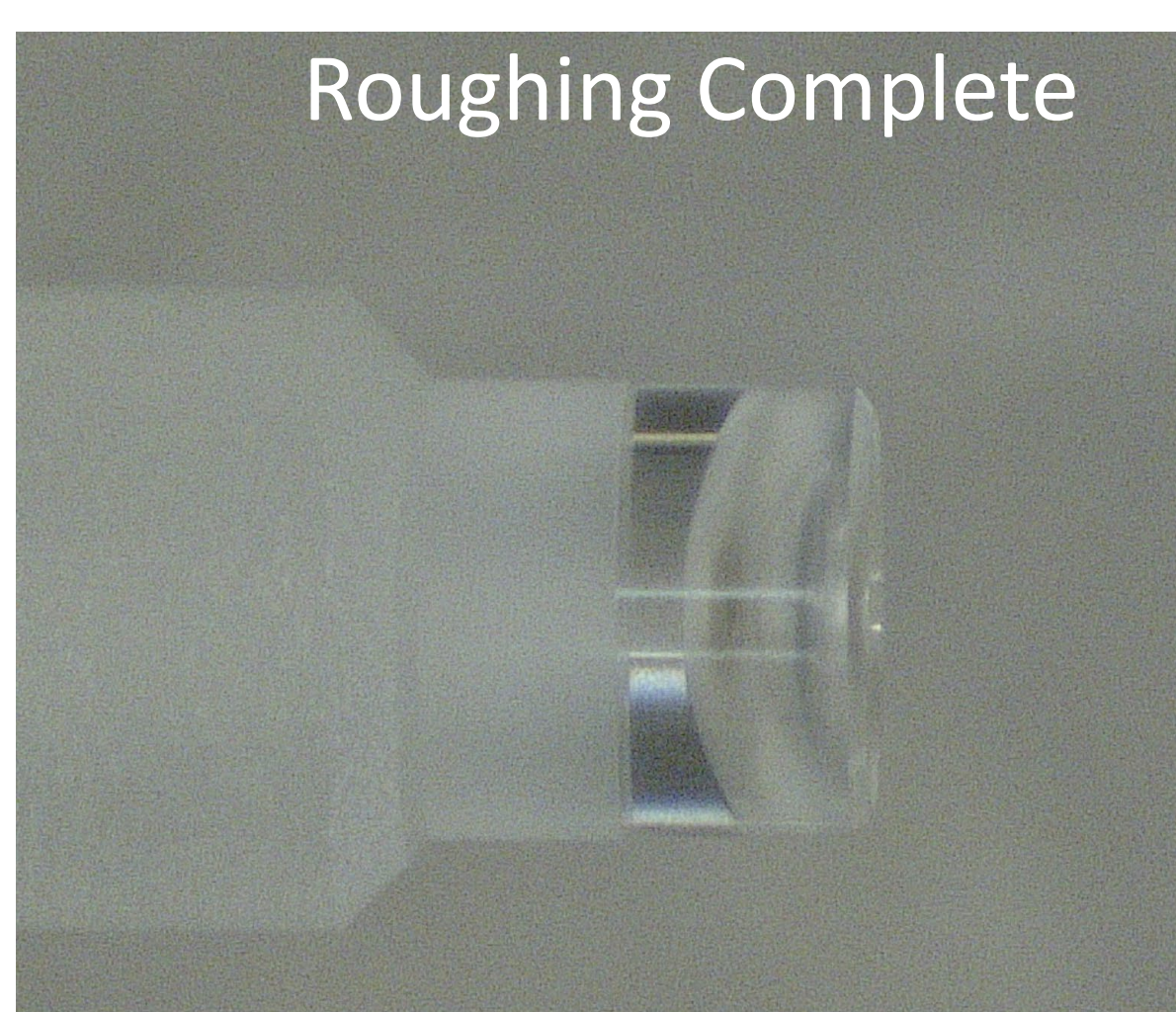
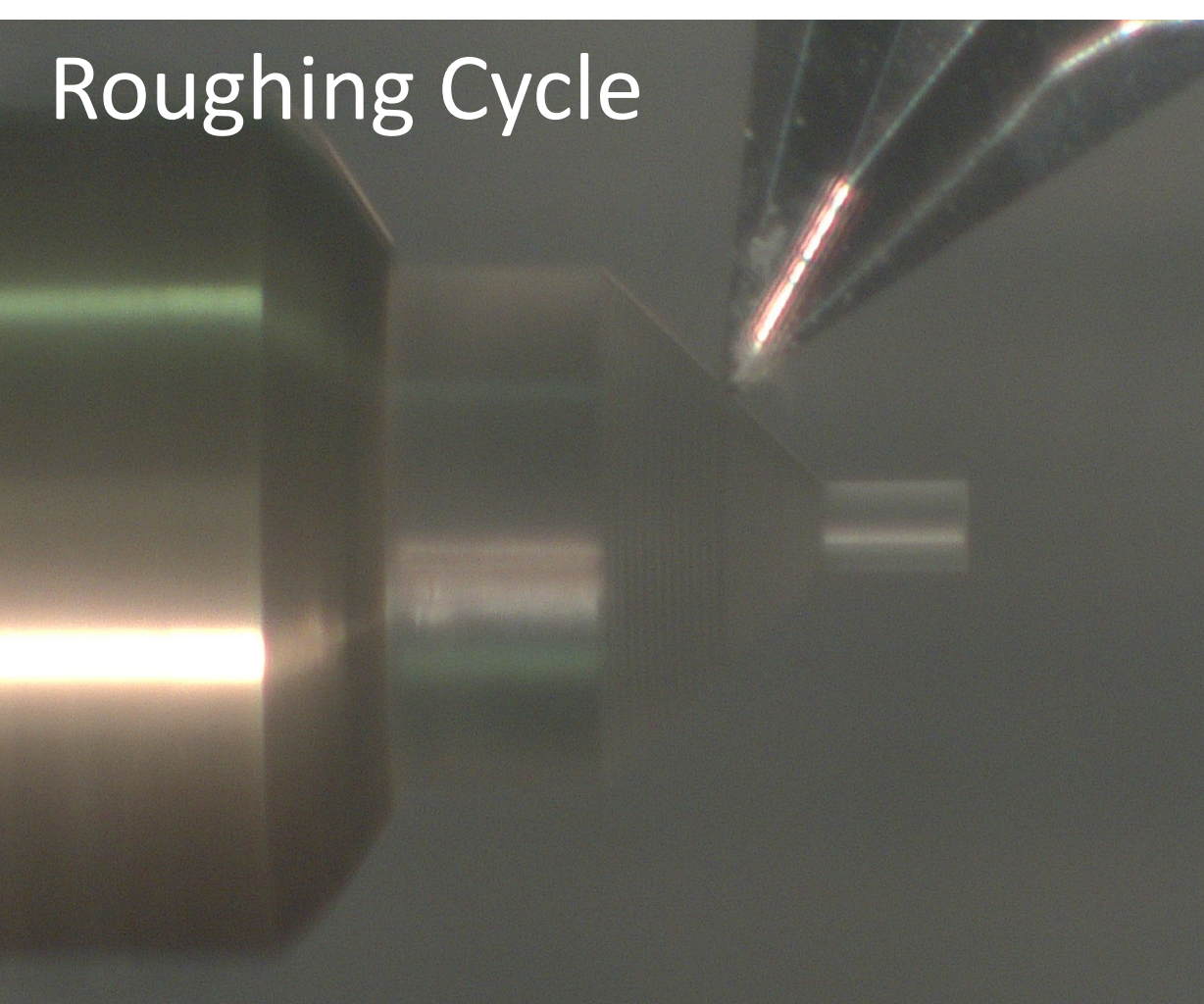
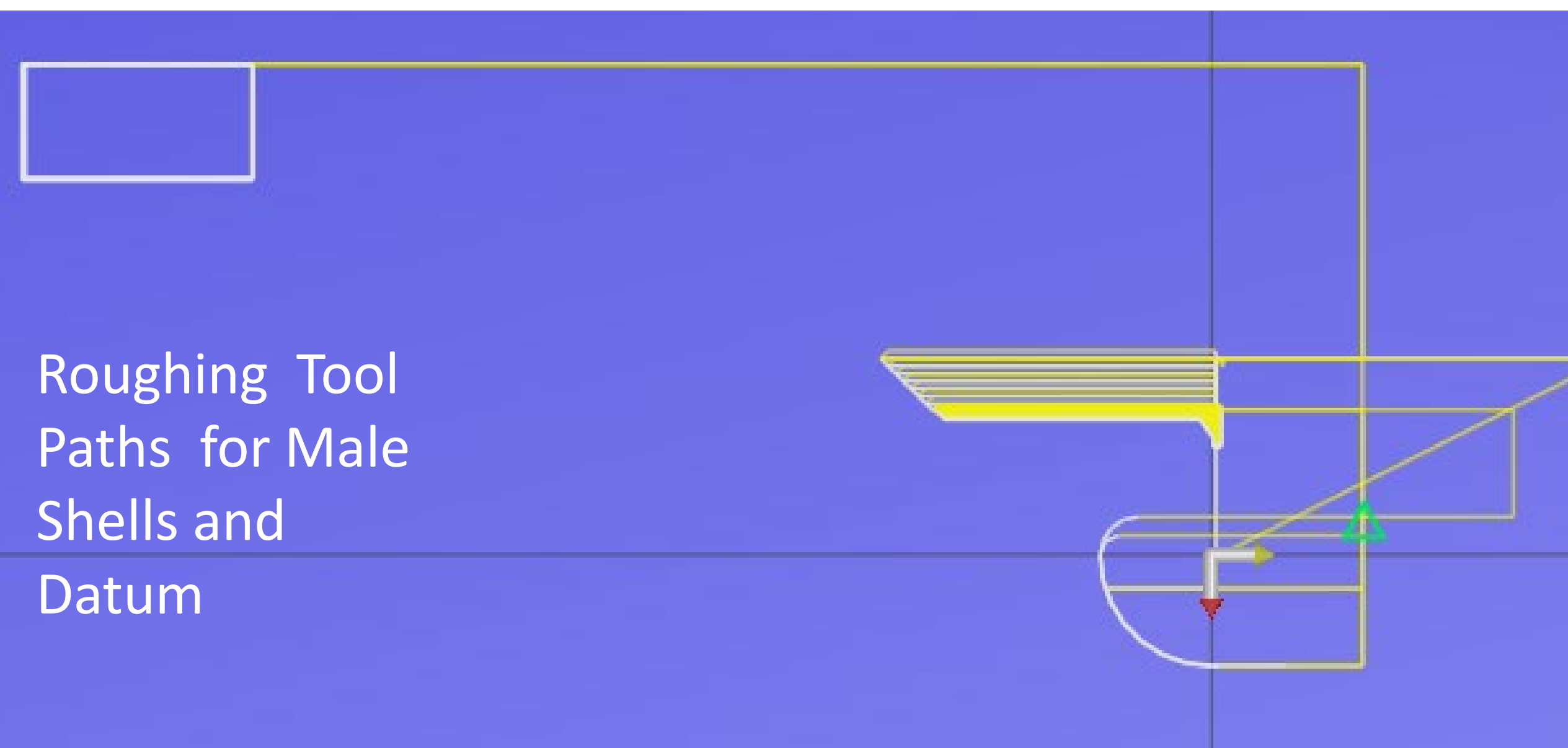


Introduction

The Bosque campaign is a 2pp printed lattice foam inside of a Rexolite outer shell. It explores the use of 2PP Foam (3-D printed foam) encapsulated in two semi-finished Rexolite shells that are subsequently machined to finished dimensions. The machining process for Bosque shells include a coordinated multistep process to ensure the quality of the parts. This is done while maintaining the best achievable concentricity of all components throughout the manufacturing process.

Roughing

Bosque shells utilize Erowa Mandrel systems outfitted with brass inserts to establish datums and ensure repeatability through out the machining process. First the Male and Females are roughed out using traditional carbide tools and turning practices.

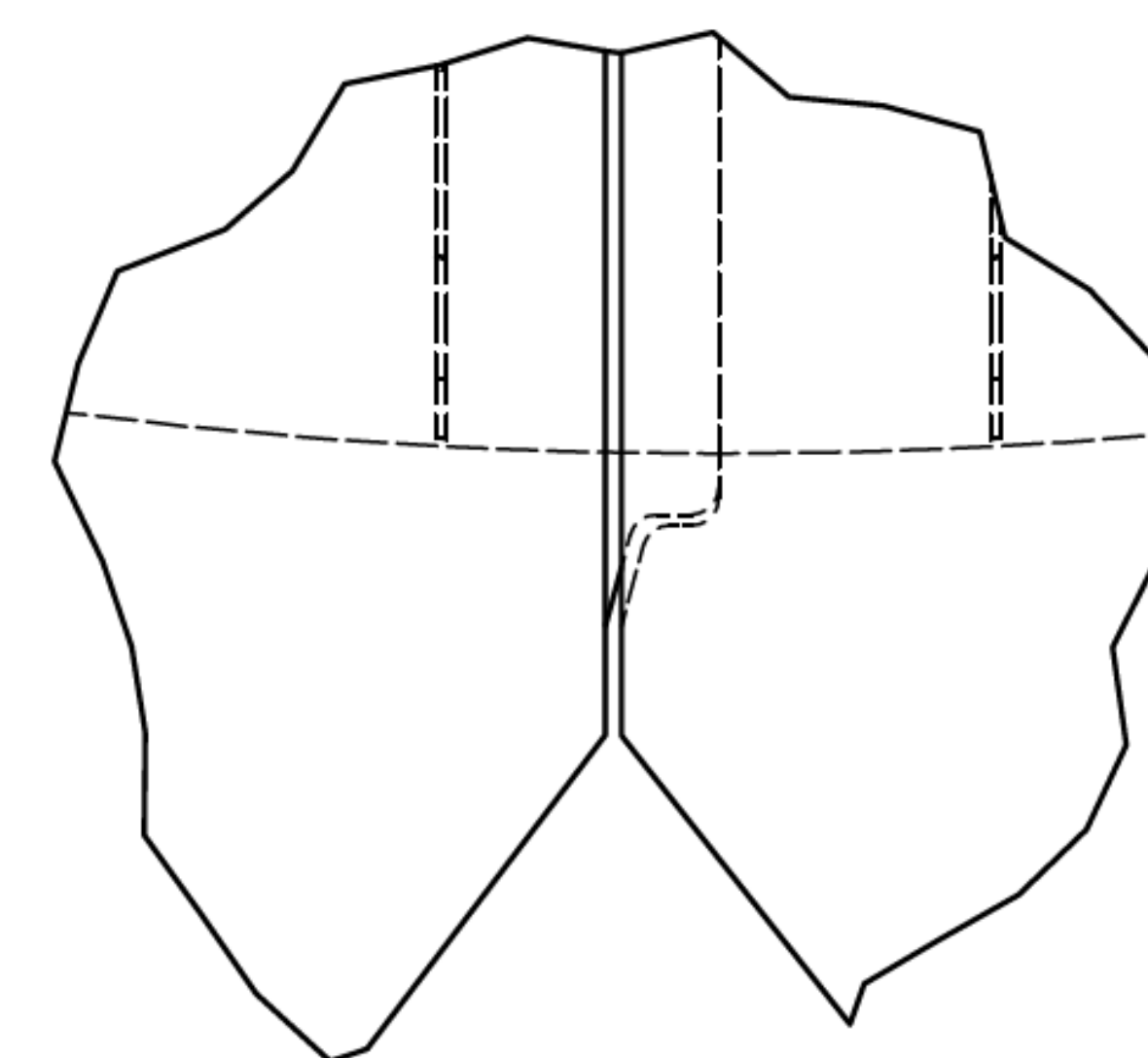
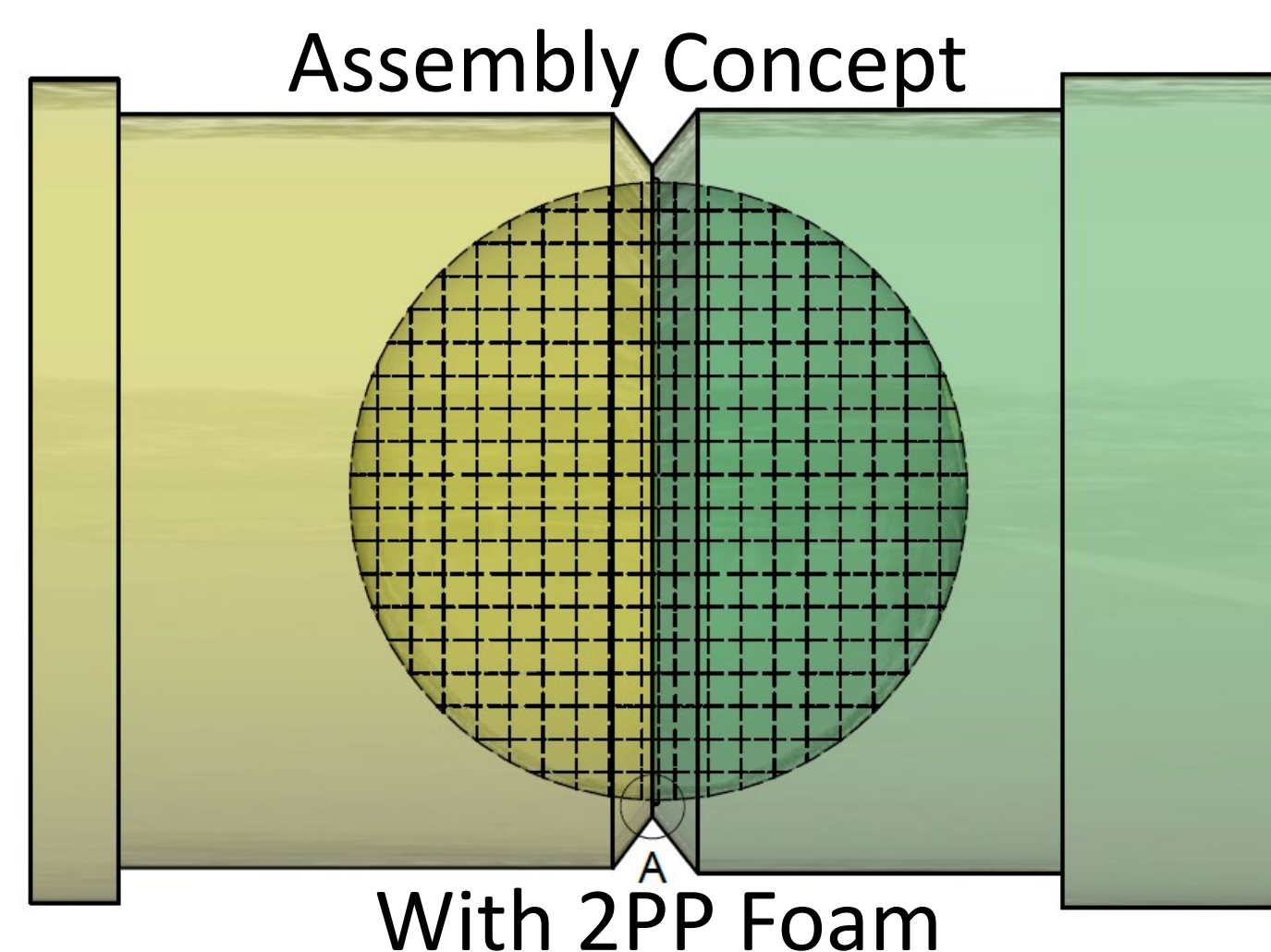


Semi-Finishing and Assembly

After roughing, the ID's and joints of both male and female shells are finished on a Diamond turning lathe. The OD of the brass mandrels are also machined in this step to ensure concentricity during subsequent OD finish operations. Female shells are then parted off and packaged for assembly with 2PP (3-D Printed foams) foams. The males are still attached to mandrels during assembly for repeatability purposes. After assembly, the OD's are then roughed out close to finished dimensions before final machining of the OD's with the diamond turning lathe.

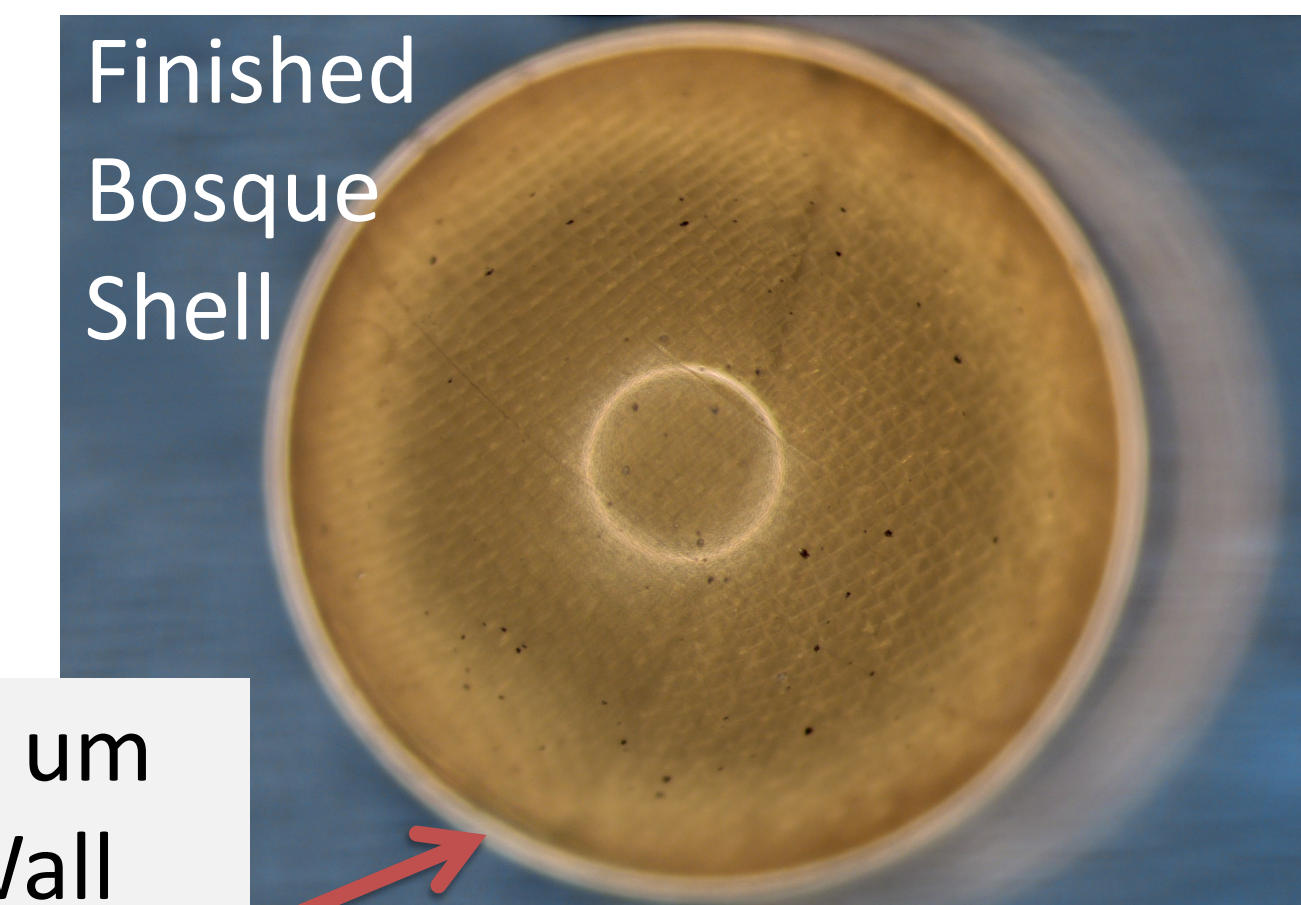
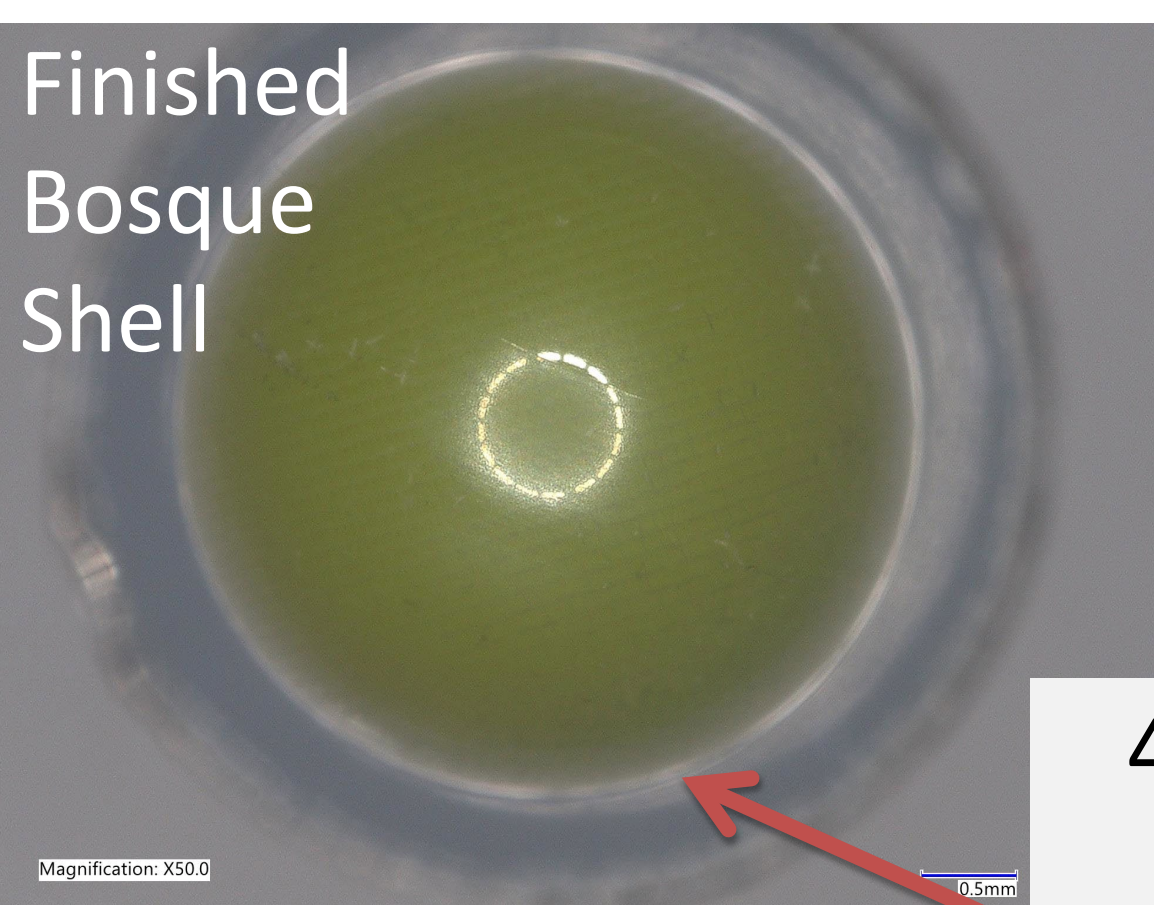
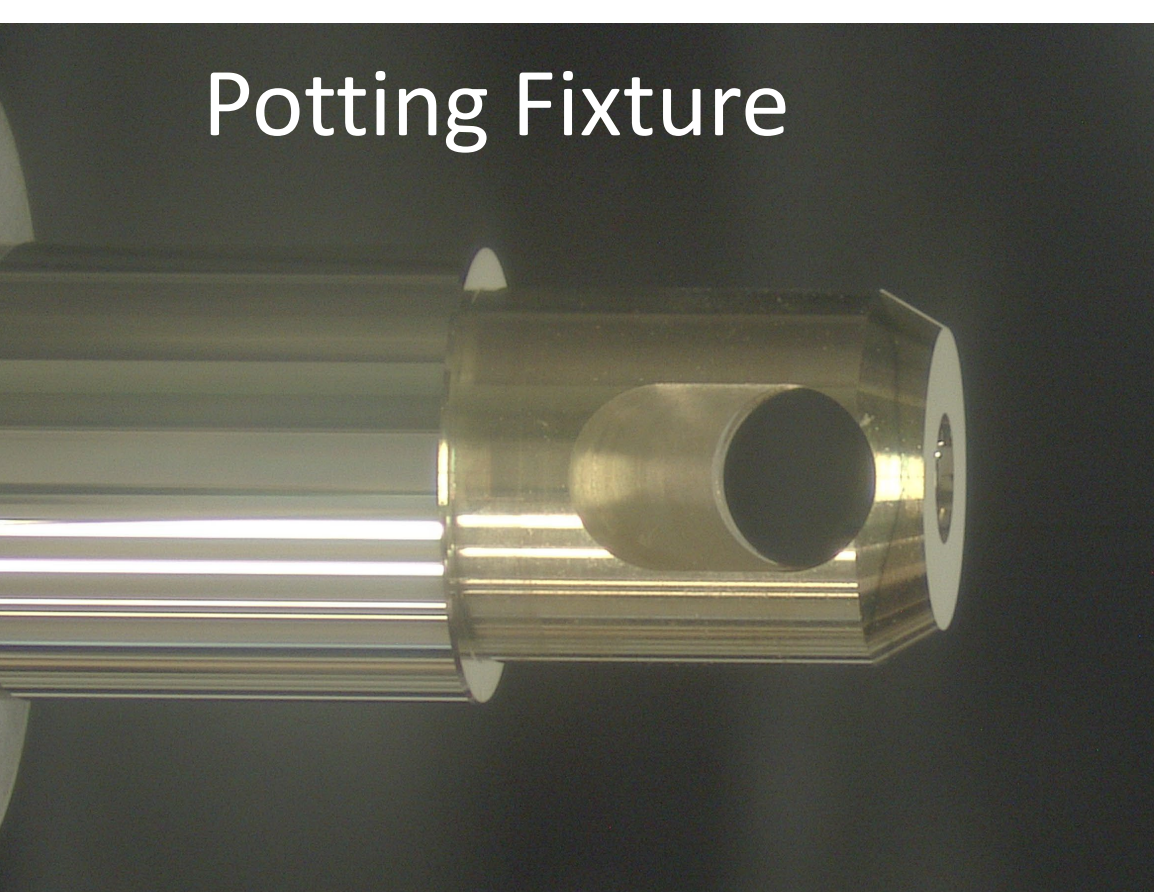


Joint Design with 2um Gap
↓
A (222)



Final OD Machining

The remaining unfinished shell still attached to the brass mandrel is then used to reference concentricity and machining coordinates. After finishing the OD of one shell, it is then subsequently parted off again, with the finished female OD being inserted into a potting fixture for the final finishing operations of the Male OD. Utilizing a Keyence TM_X5006 read head mounted to the Diamond turning lathe and a few facing cuts, we can determine the remaining amount of material to remove and establish the final machining coordinates.



40 um Wall Thickness

Conclusion

The Bosque Campaign at LANL has found success in limiting concentricity deviations with this manufacturing process. Furthermore, we are also able to minimize blend lines between OD finishing operations despite having multiple setups.