

Abstract - The upcoming Electron-Ion Collider (EIC) at Brookhaven National Laboratory features a proximity focusing RICH detector (pFRICH) in the electron-going endcap for particle identification ($\pi/K/p$ as well as electron vs pion separation), comprising of enclosed gas volume held with solid carbon fiber end rings and a composite sandwich vessel. This talk highlights the prototyping efforts for the solid carbon fiber end rings as well as the sensor plate support structure for pFRICH HRPPD photosensors. The tool shape compensation analysis is presented for the segmented end rings with studies on different types of composite bonds for solid rings. A finite element analysis is presented for the structural performance simulations for the pFRICH detector. This analysis informs the design of the sensor plate composite structure to minimize deflection under loading while maintaining the position of the HRPPDs and minimizing mechanical stress on the sensors. Results from the first prototype for the sensor plane structure are also presented.

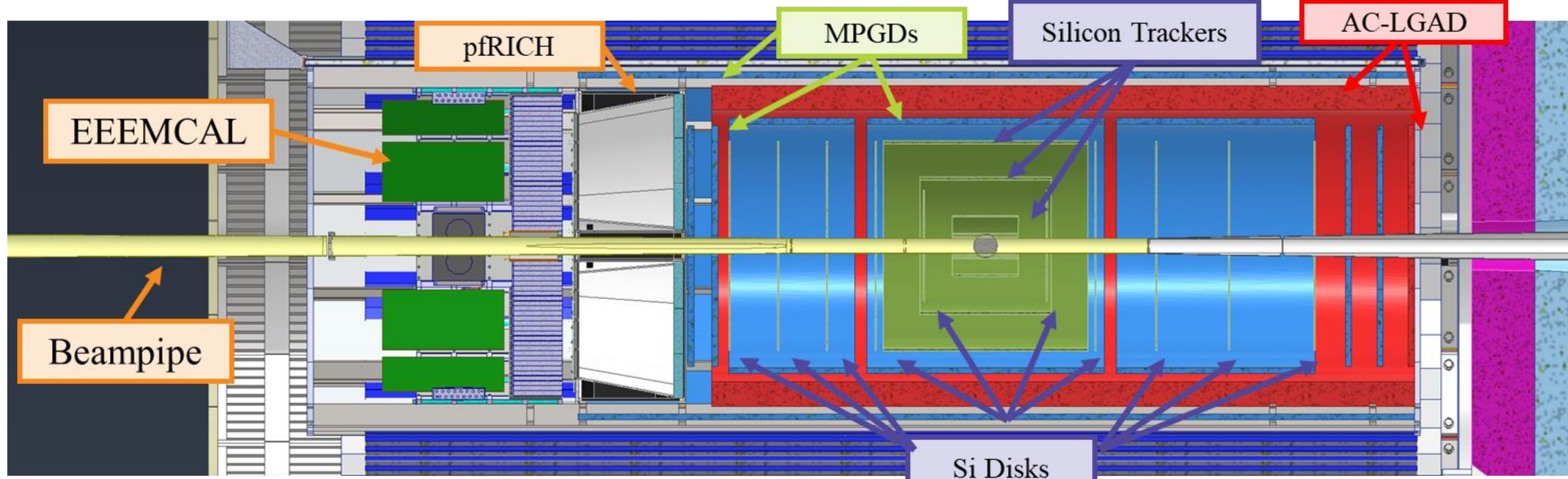


Figure 1: ePIC detector

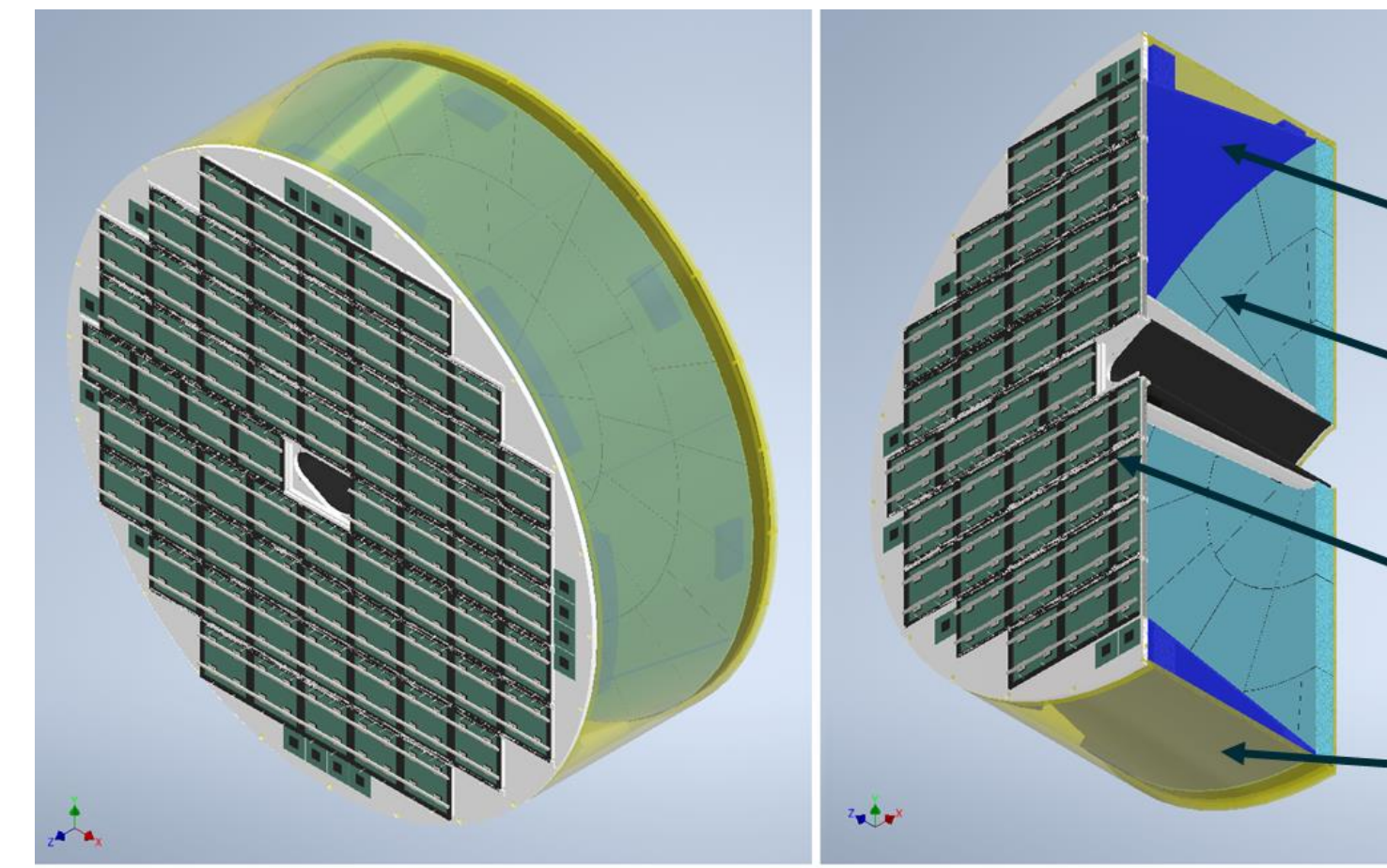


Figure 2: pFRICH detector overview

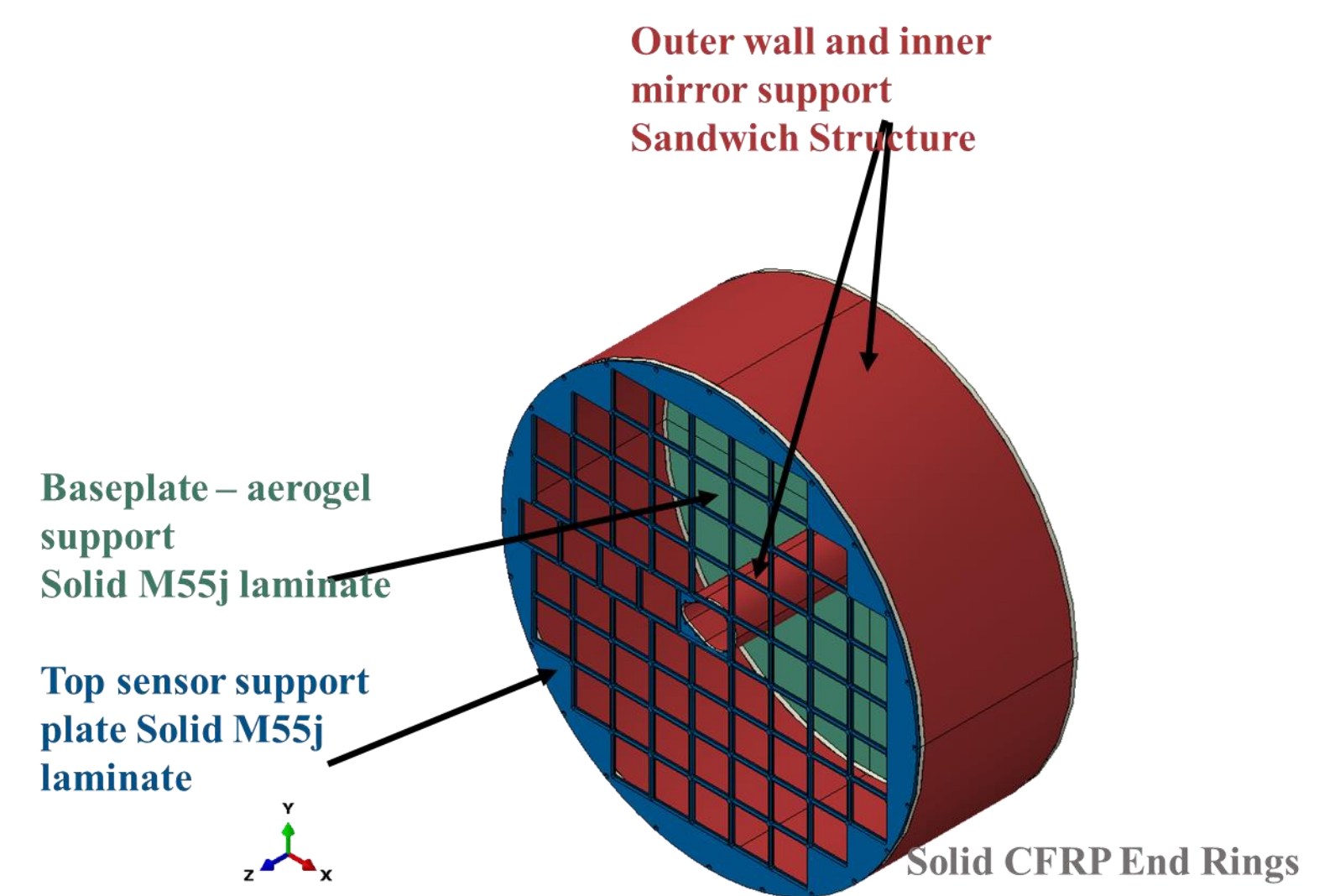


Figure 3: pFRICH support structure

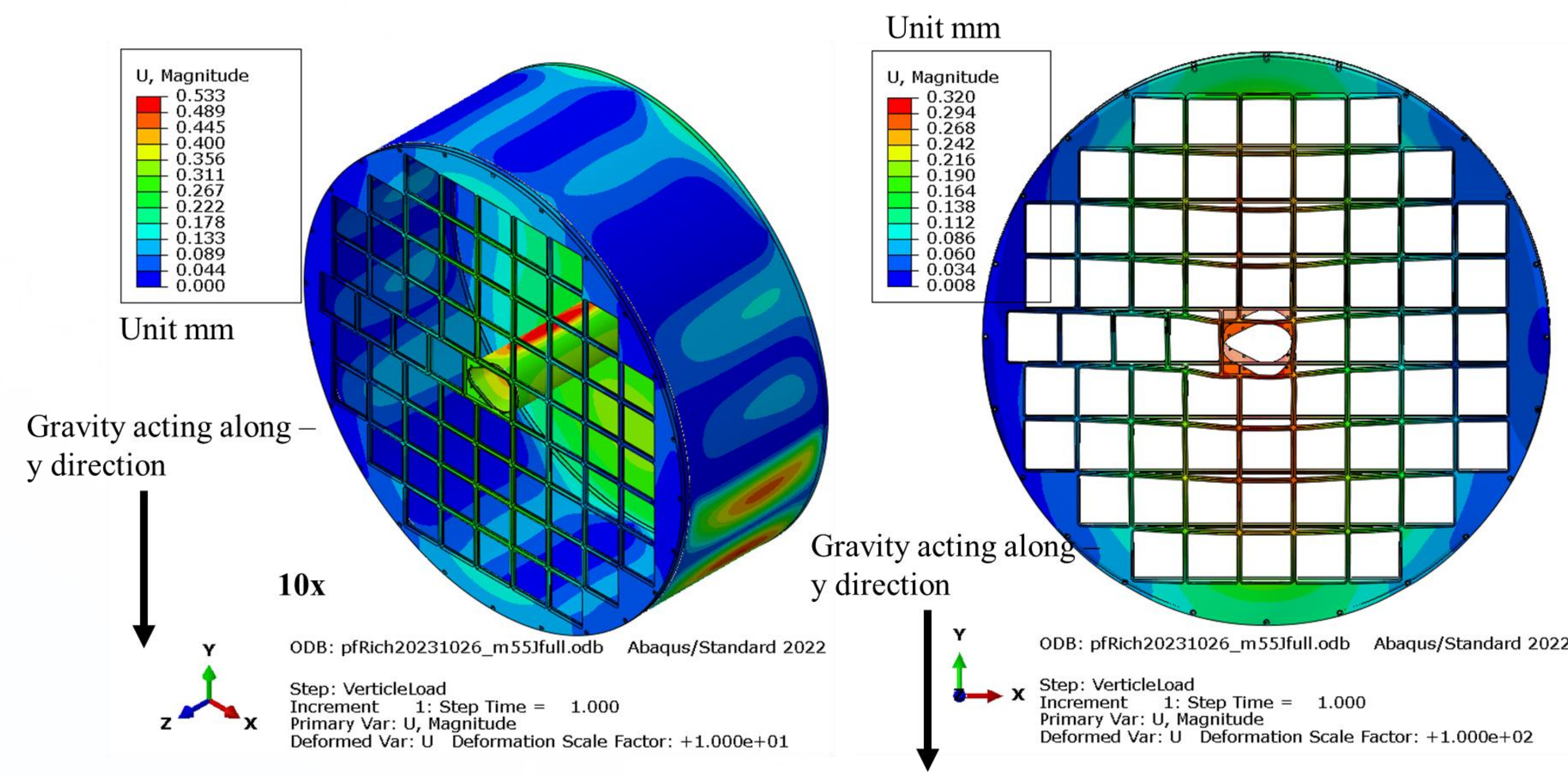


Figure 4: Structural performance simulation under self weight

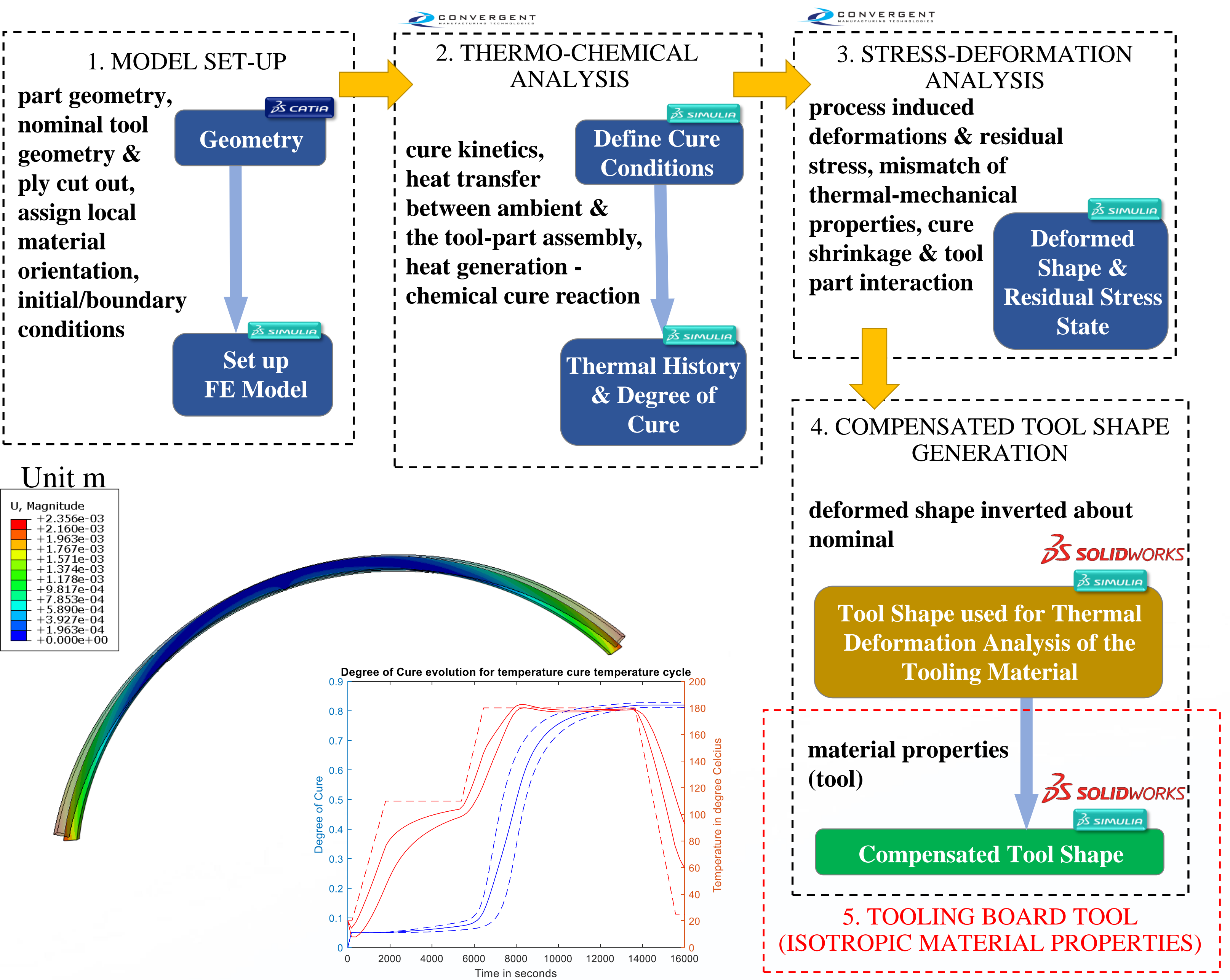
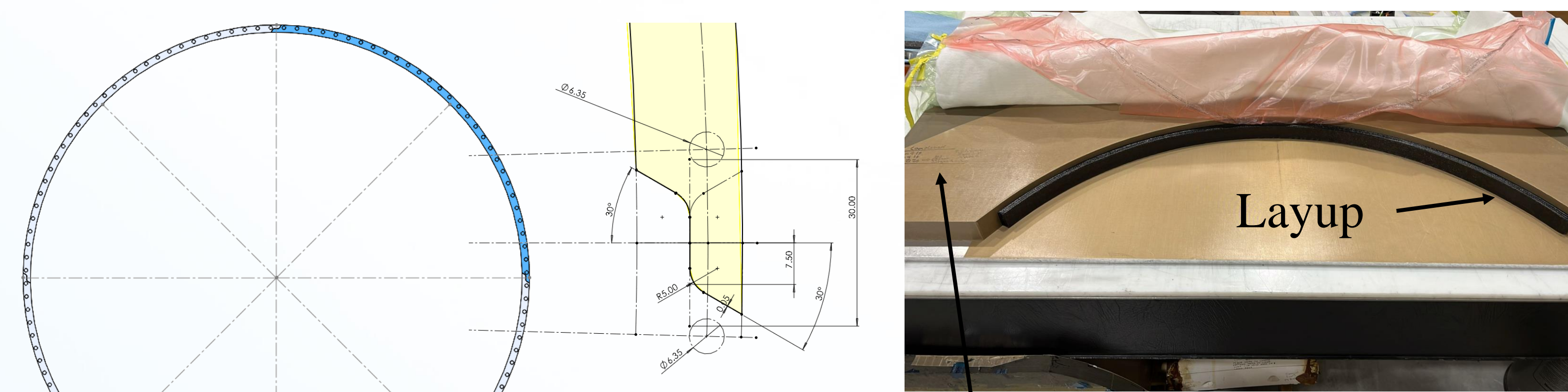


Figure 5: Tool shape compensation using COMPRO. Manufacturing of composite laminate parts induces residual stresses due to anisotropic thermo-viscoelastic cool down from processing temperatures and cure shrinkage of the resin. The deformation is predicted and corrected for before tool manufacturing.

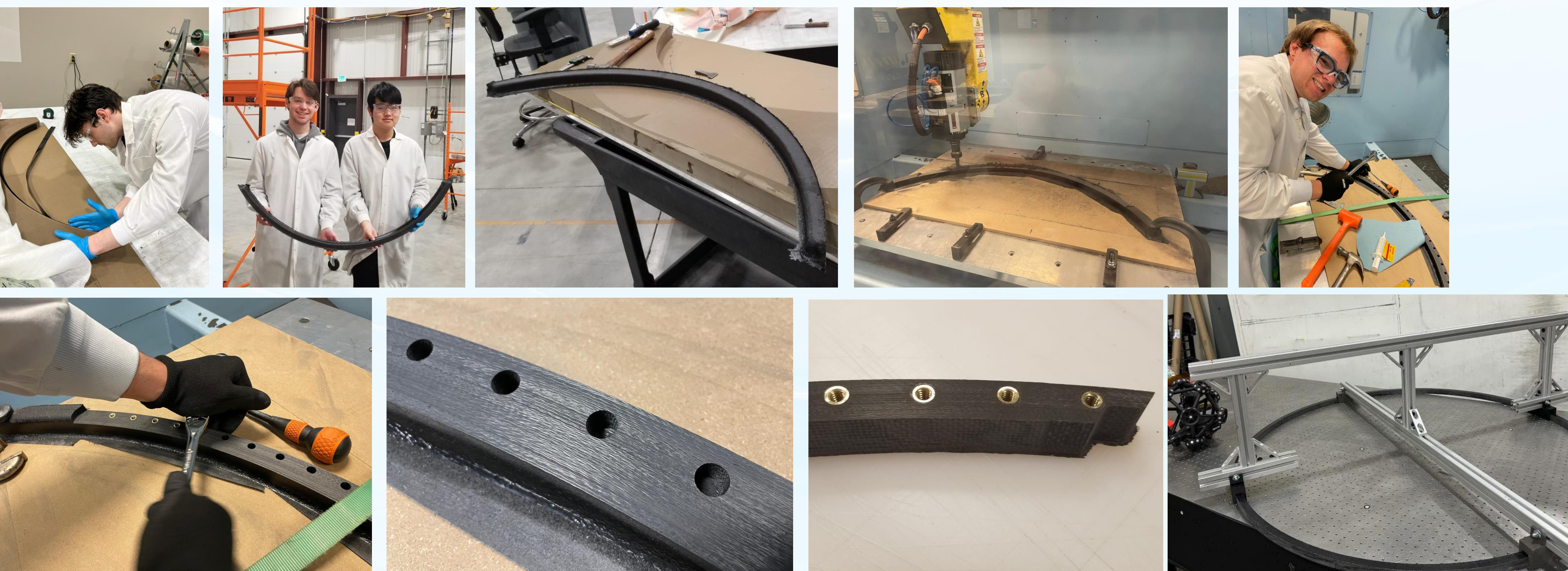
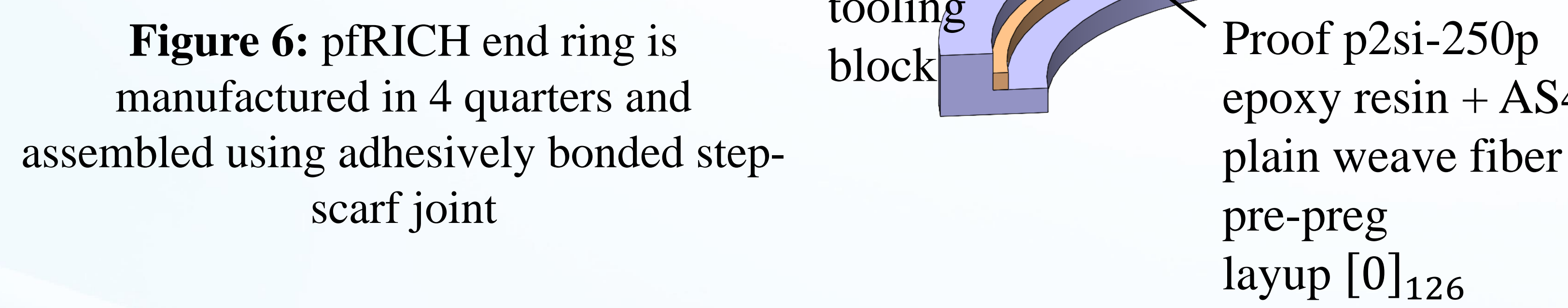


Figure 7: pFRICH end ring prototyping process consists of layup – curing – CNC machining – inserts for sensor plane mounting – assembly and bonding – metrology and QC.

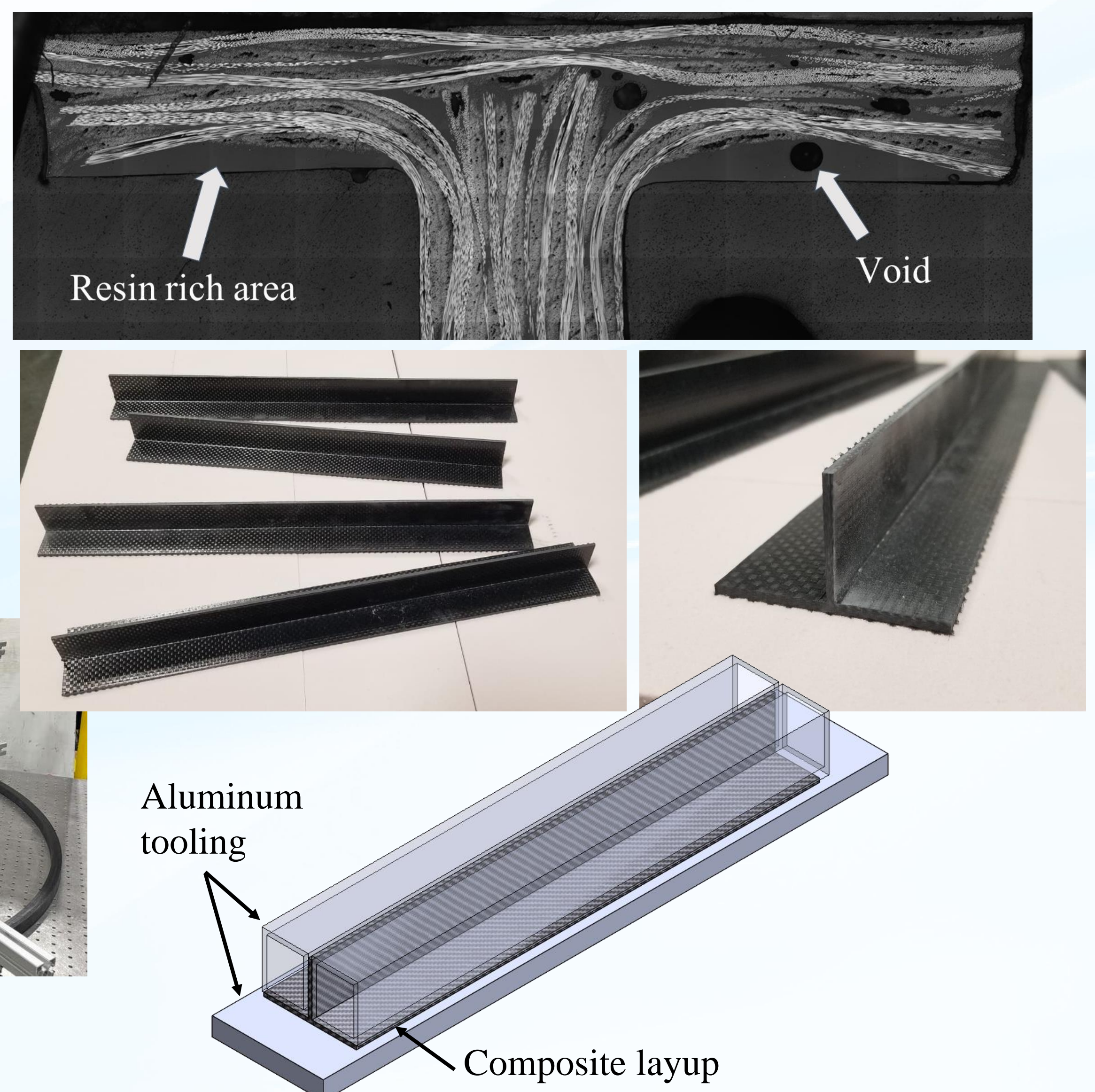


Figure 8: pFRICH sensor plane – T-beam prototyping