

# Bending and assembly of the L0 and L1 layers

SVT Bari team

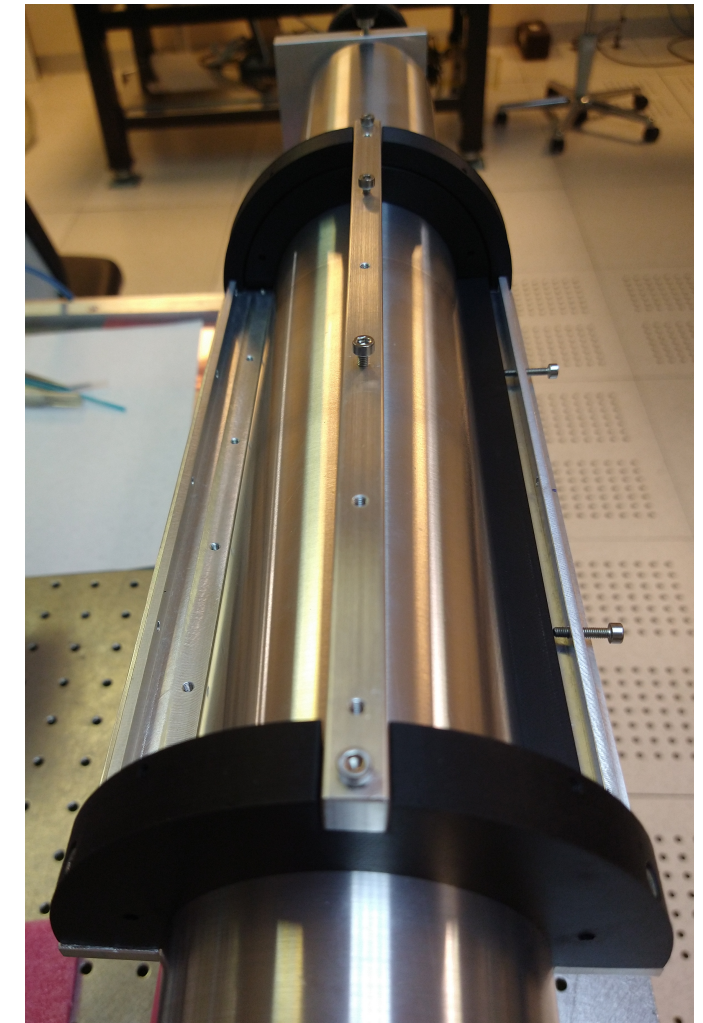
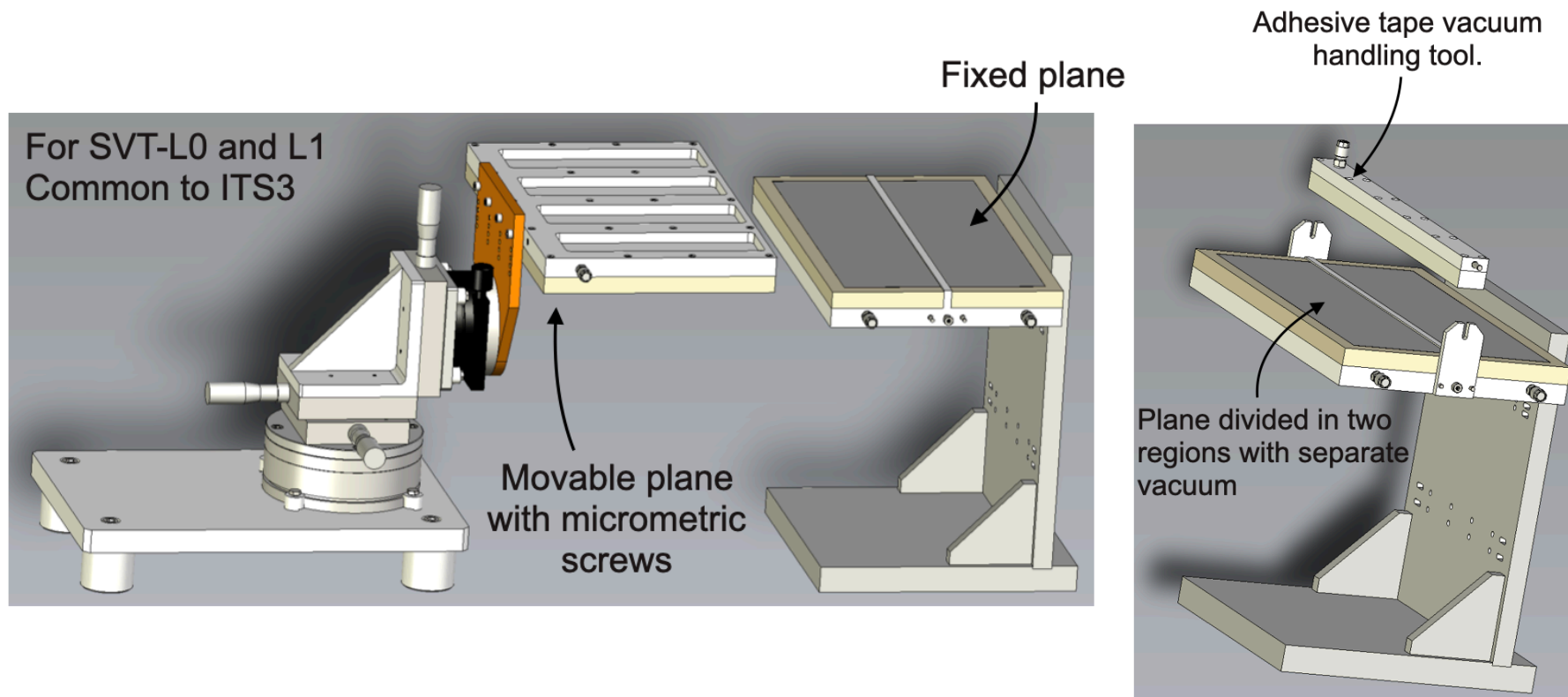
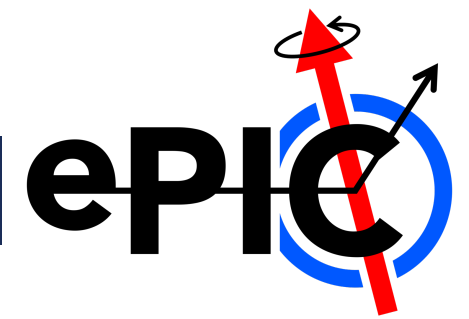
D. Elia, M.T. Camerlingo, S. Martiradonna,  
C. Pastore, V. Valentino, D. Colella

1. New sensor handling tools and support structure gluing tools
2. SVT-L0 half-layer attempt n. 3



# Recent progresses

## New sensor handling tools and support structure gluing tools



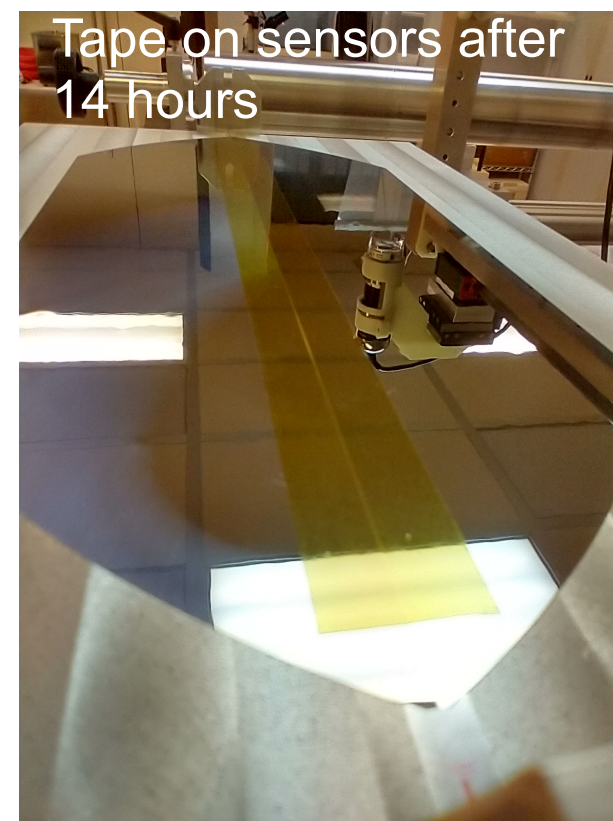
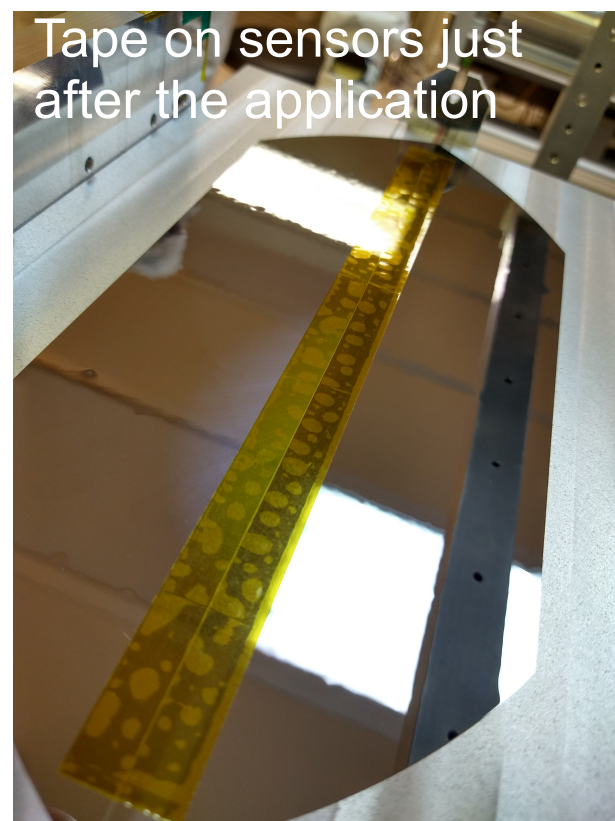
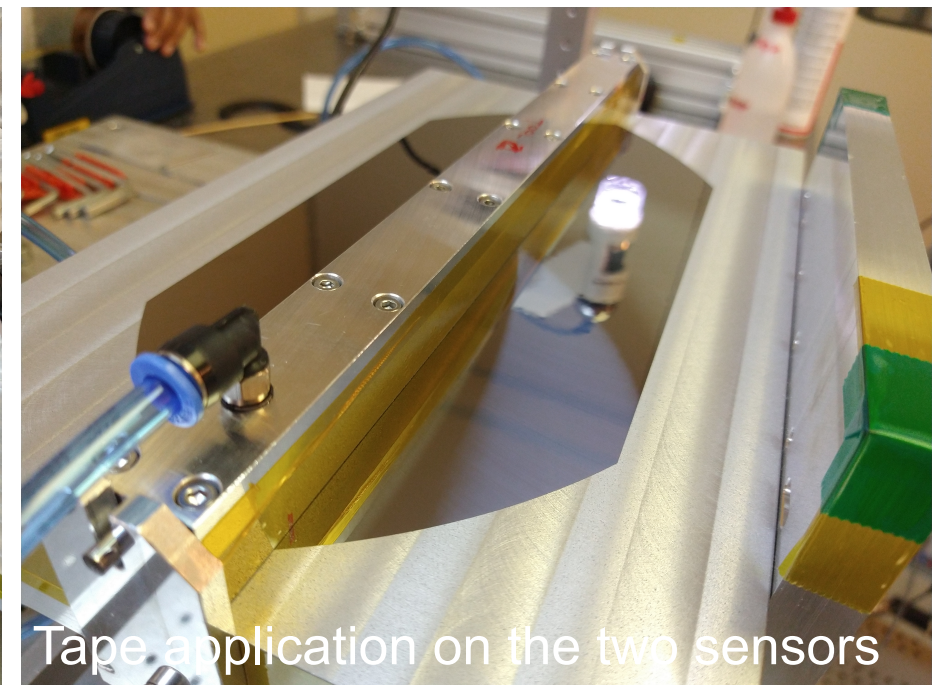
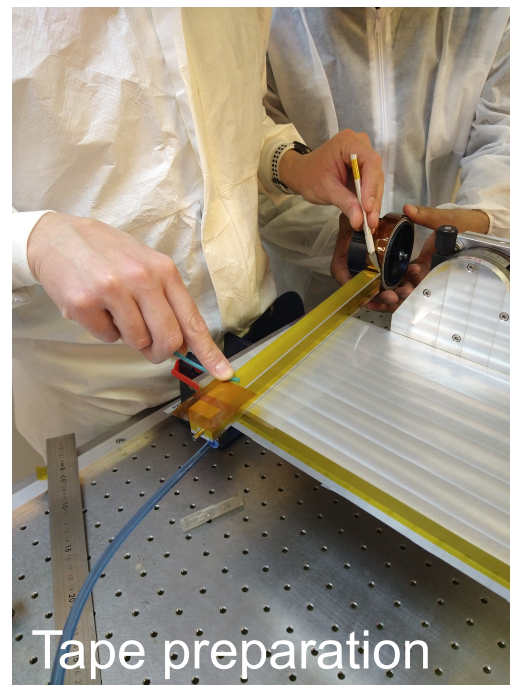
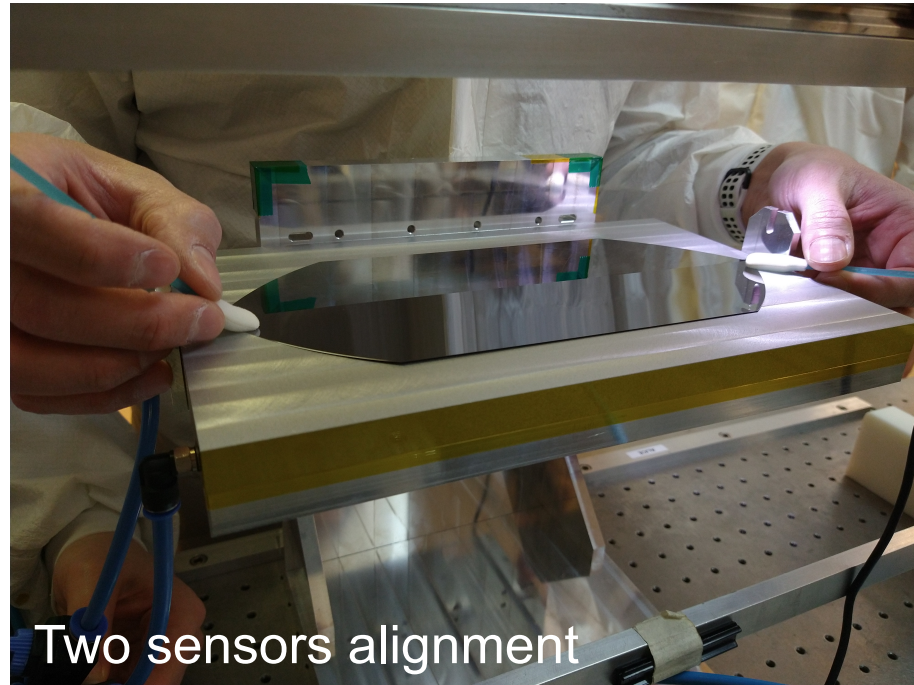
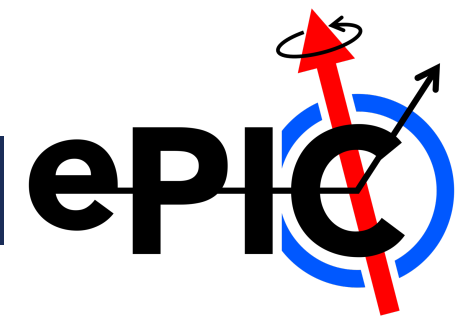
Required to:

- Precisely align and join the two sensors
- Handle the joint sensors during the bending procedure to approach the mandrel
- New tool for support structures gluing



# Recent progresses

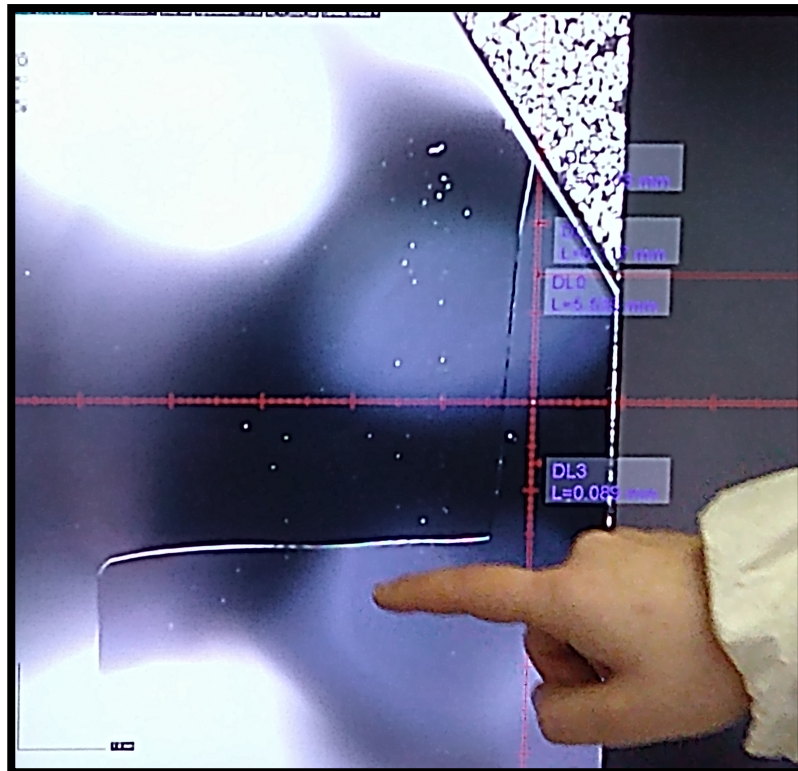
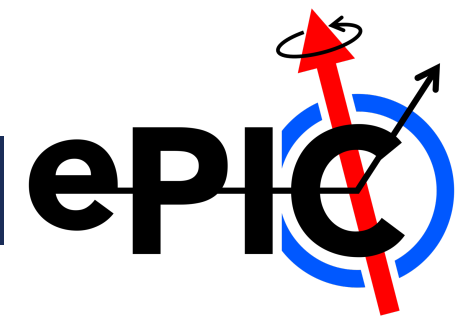
SVT-L0 half-layer attempt n. 3



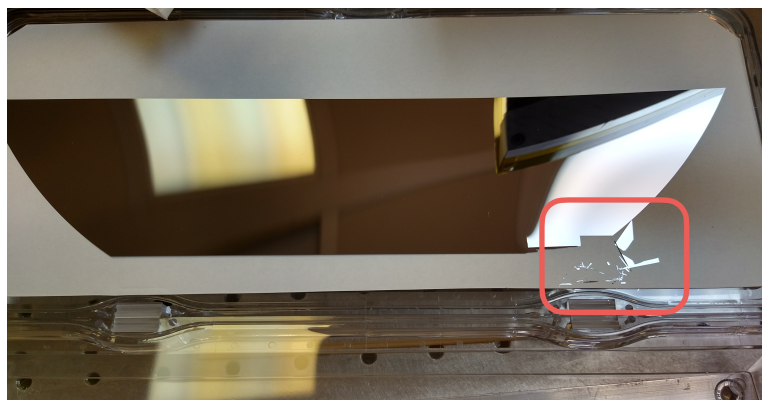


# Recent progresses

SVT-L0 half-layer attempt n. 3

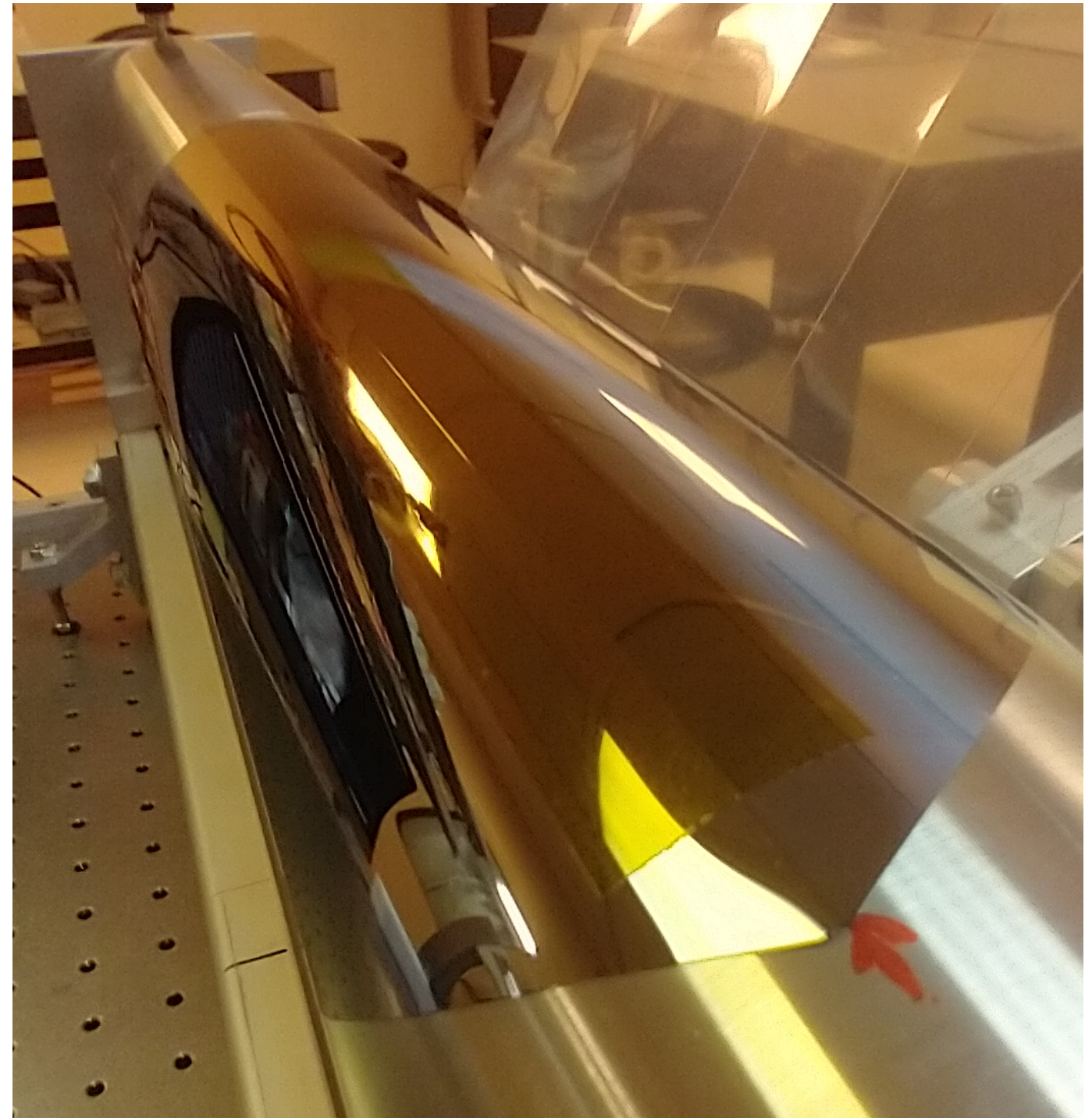


Crack stopped during bending procedures using microscope (not easily visible by eye).



Broken silicon pipe found in the same box

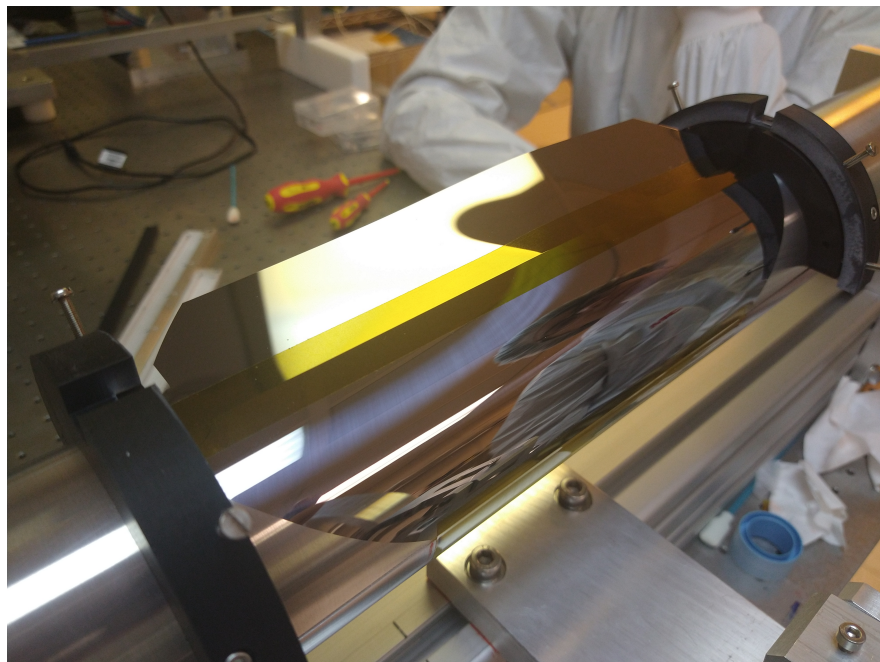
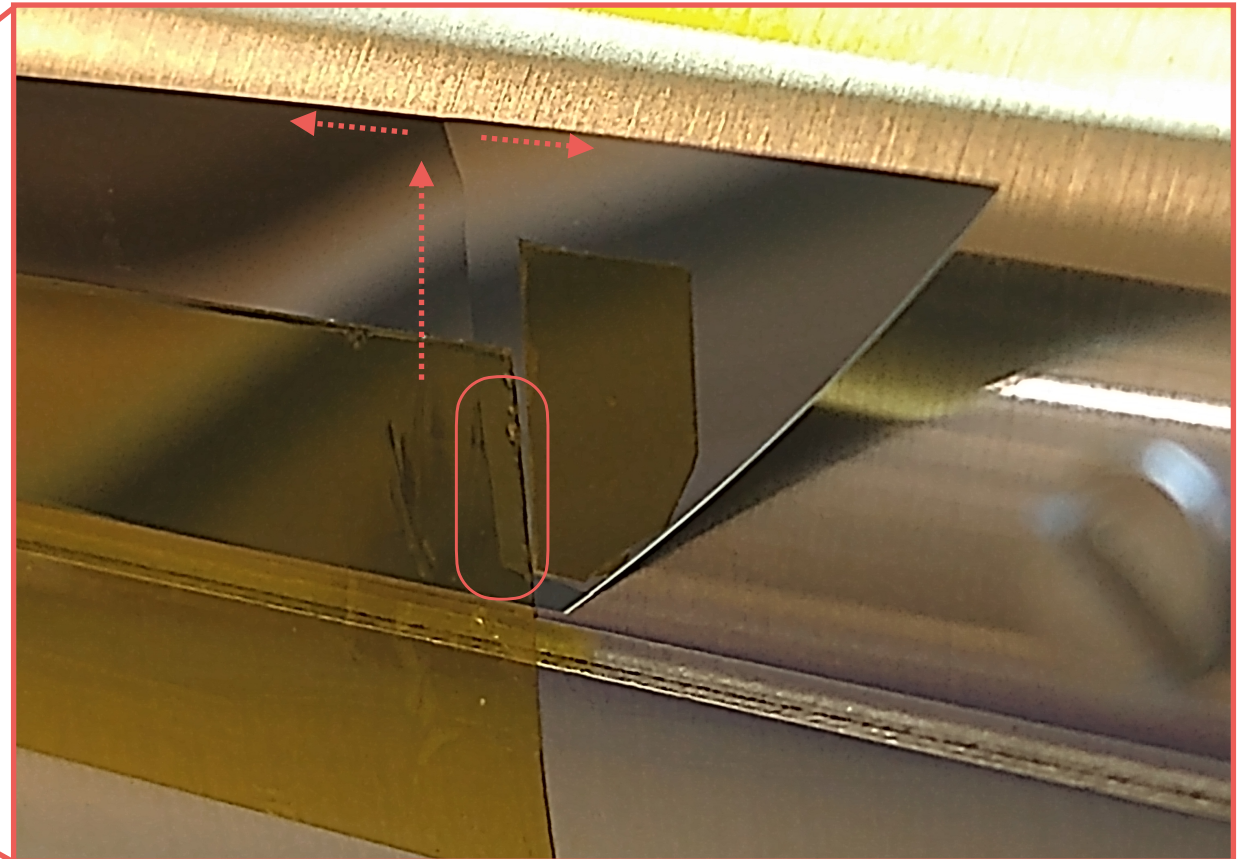
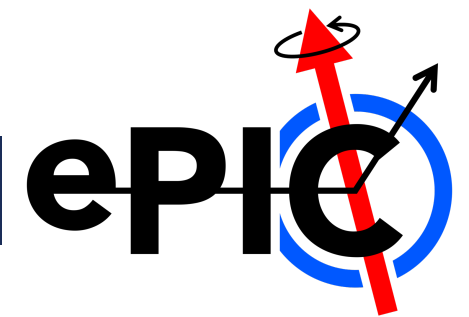
- Don't stack many silicons in the same box
- Visual inspection before each assembly



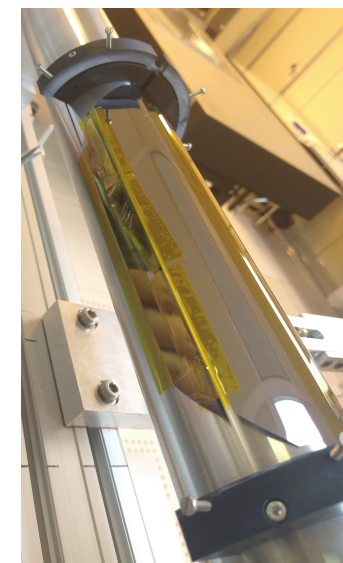


# Recent progresses

SVT-L0 half-layer attempt n. 3



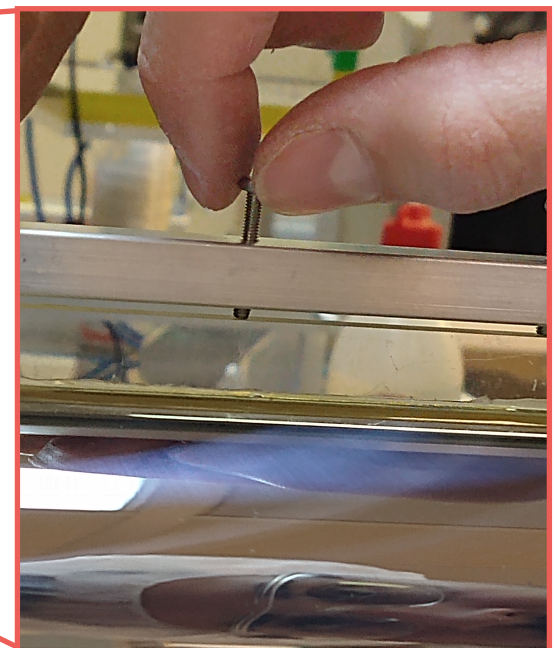
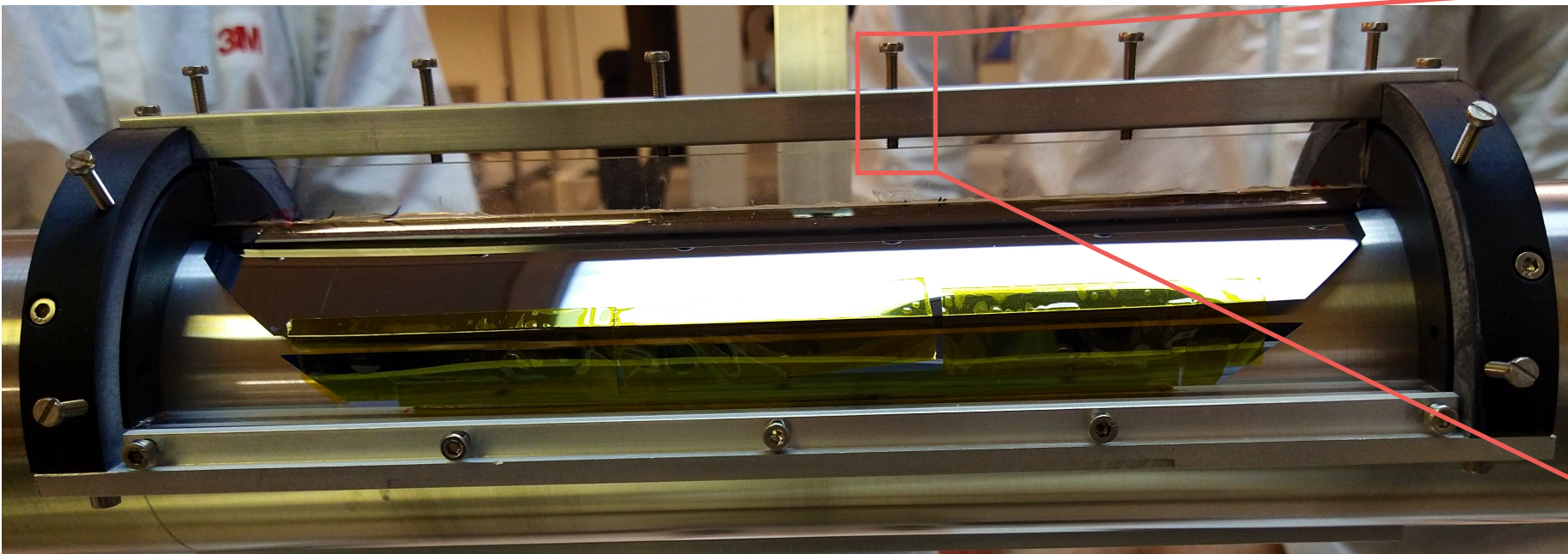
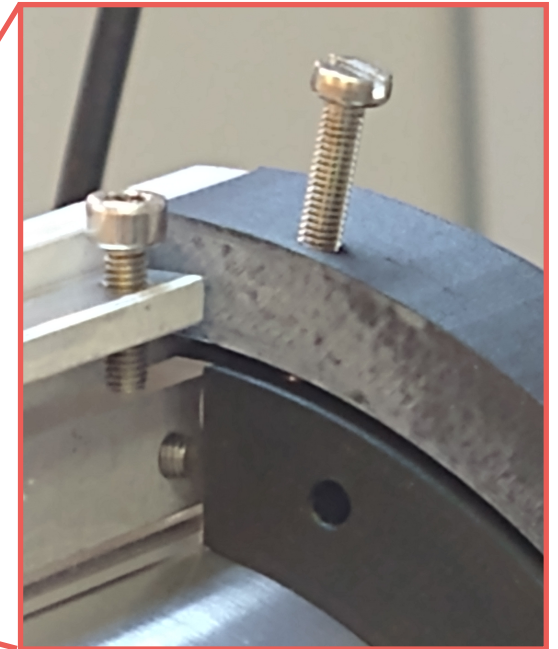
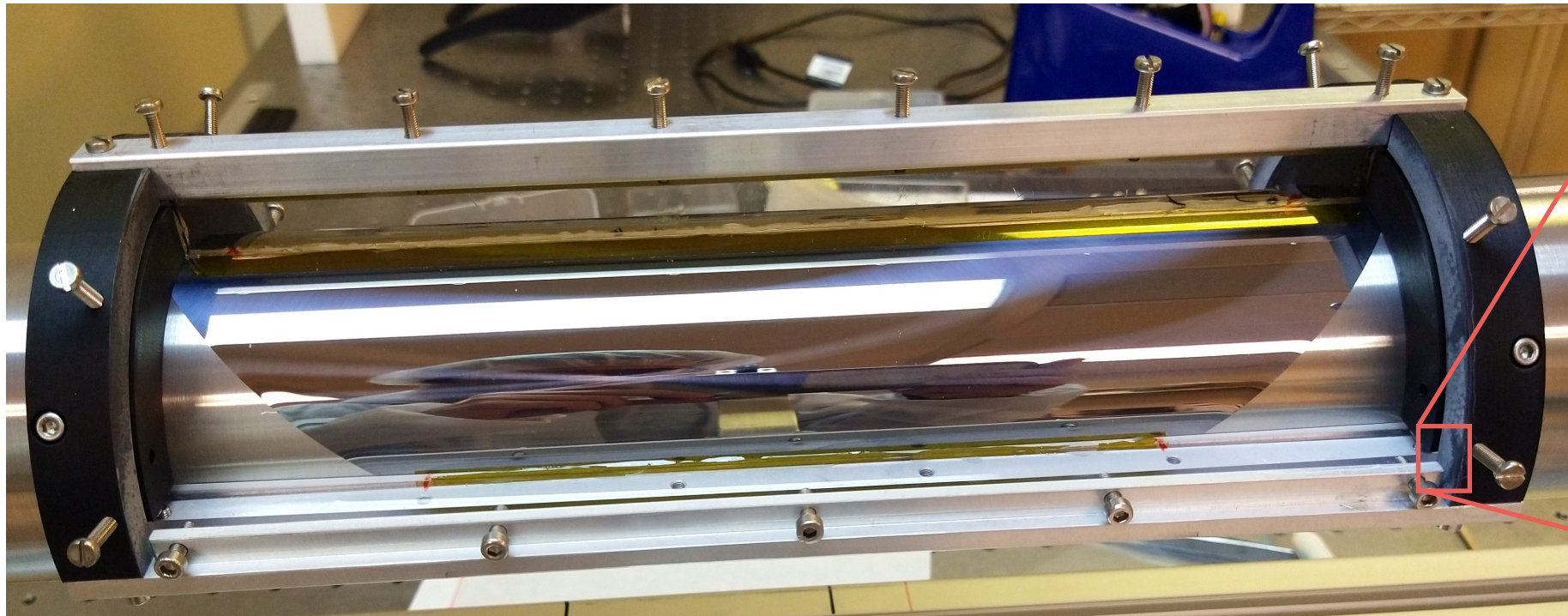
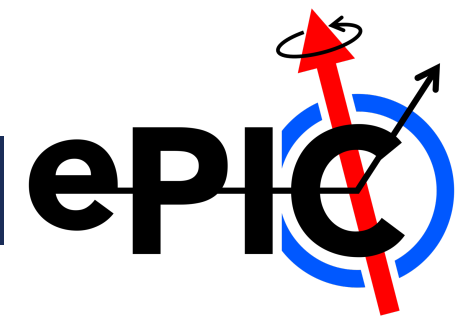
Fancy patchwork to finalize the exercise of verification of support structure gluing tools





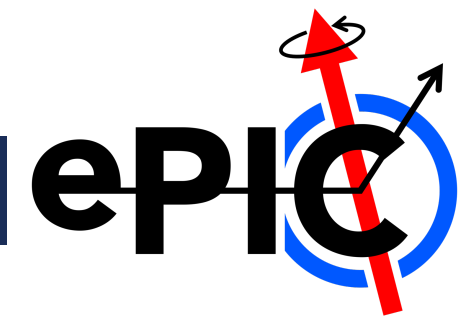
# Recent progresses

SVT-L0 half-layer attempt n. 3



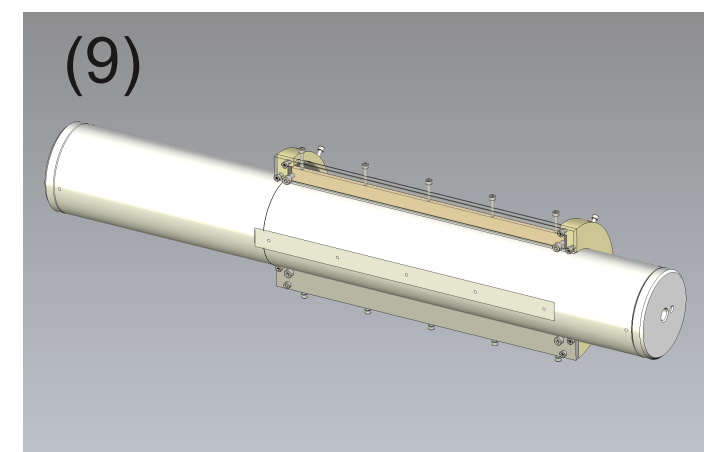
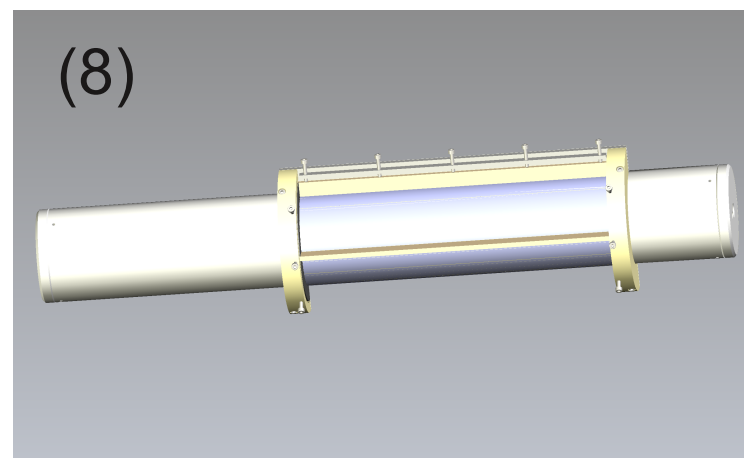
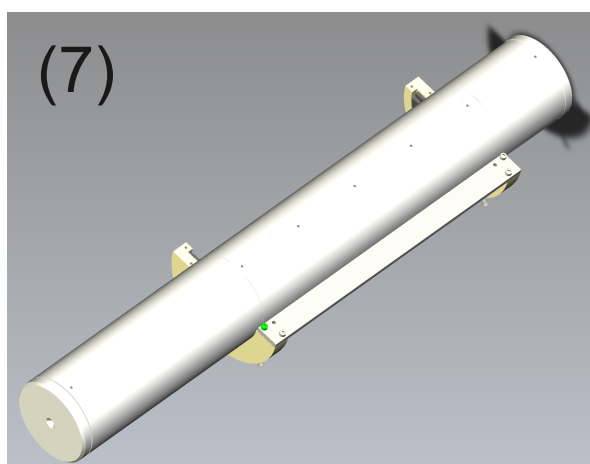
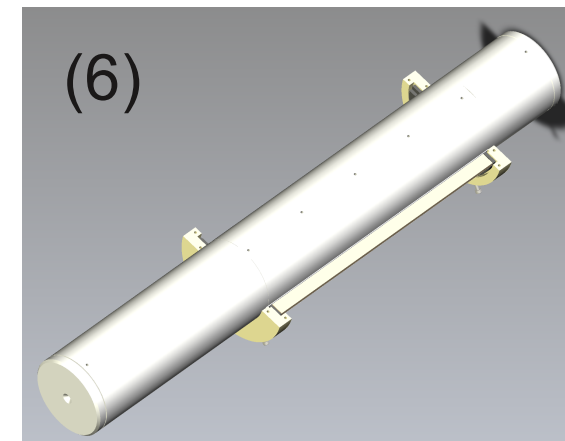
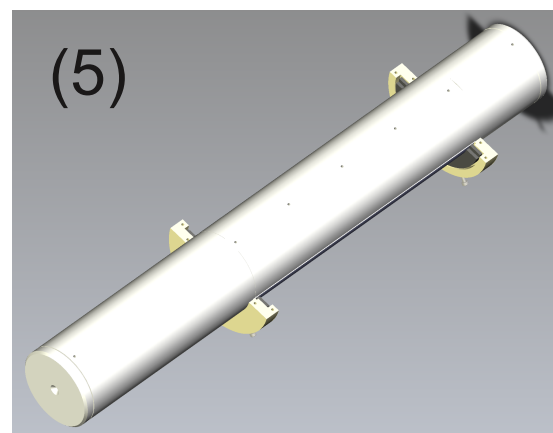
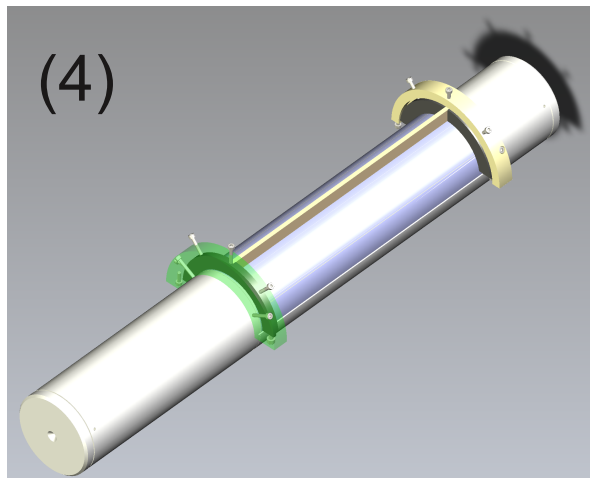
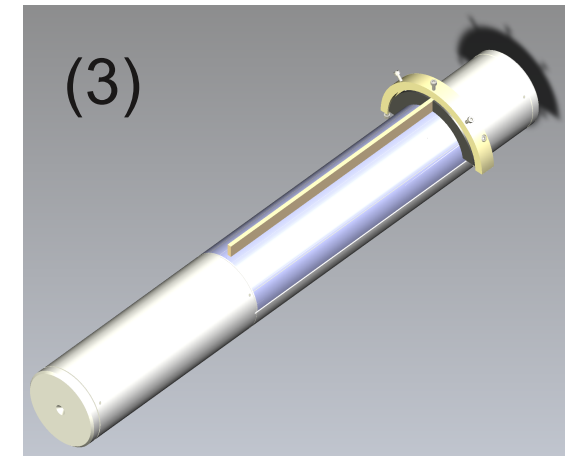
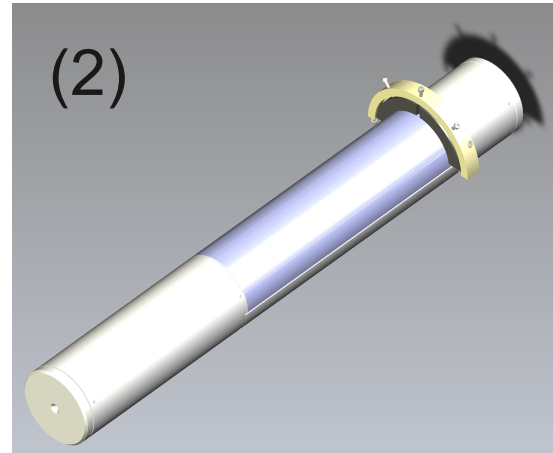
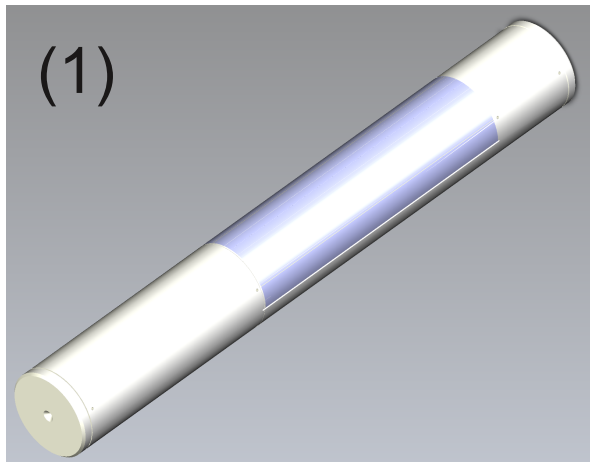


**BACKUP**



# Recent progresses

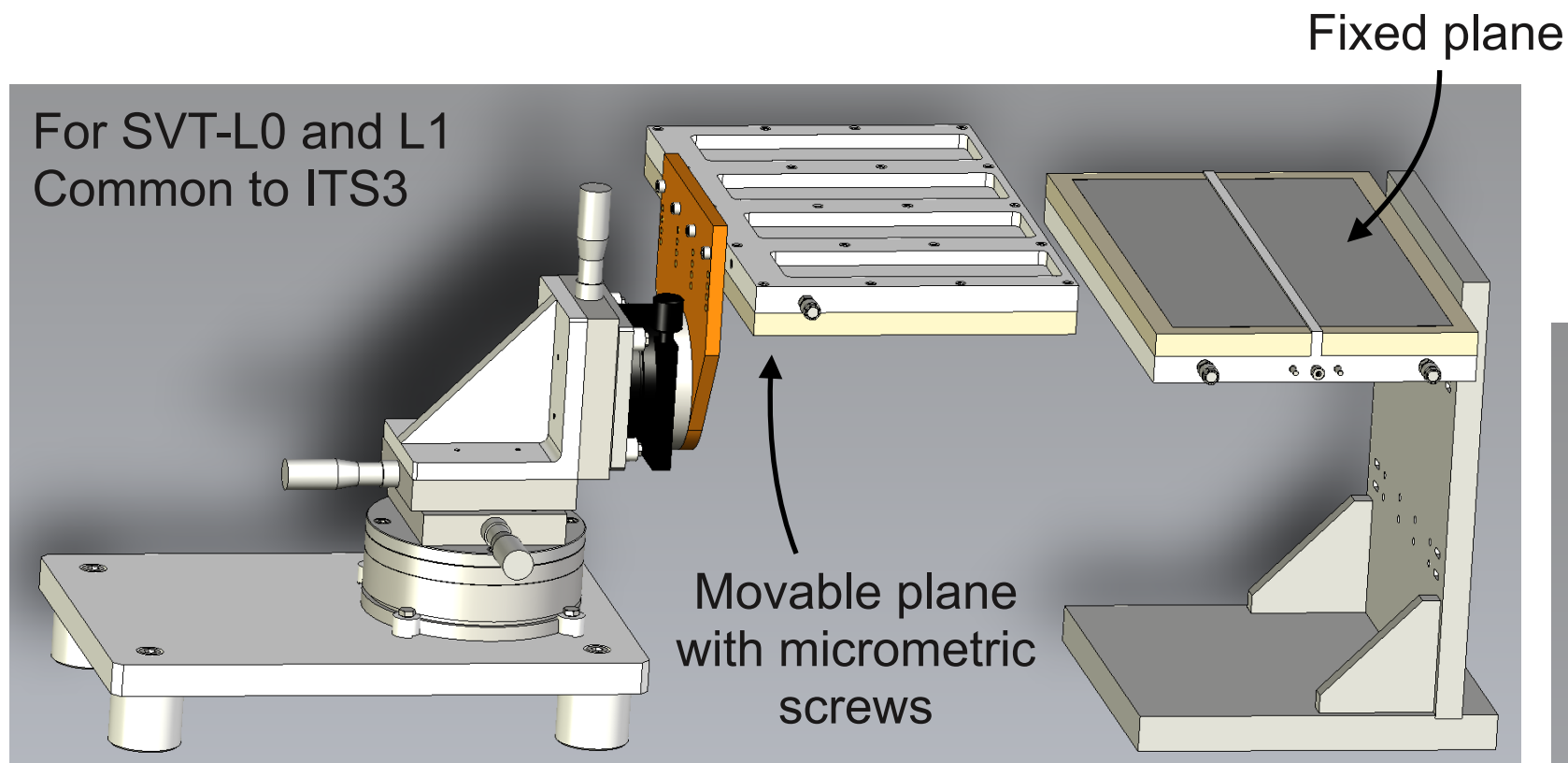
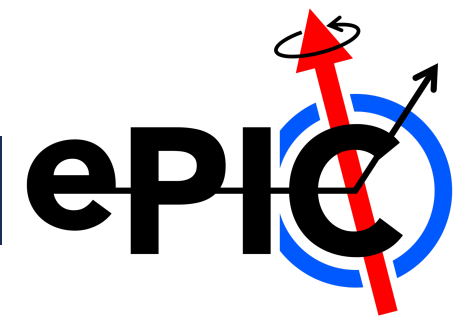
## Support structures gluing tool



Tools under refinement after successful gluing.  
Mainly improving pressing components for longerons to the sensors.

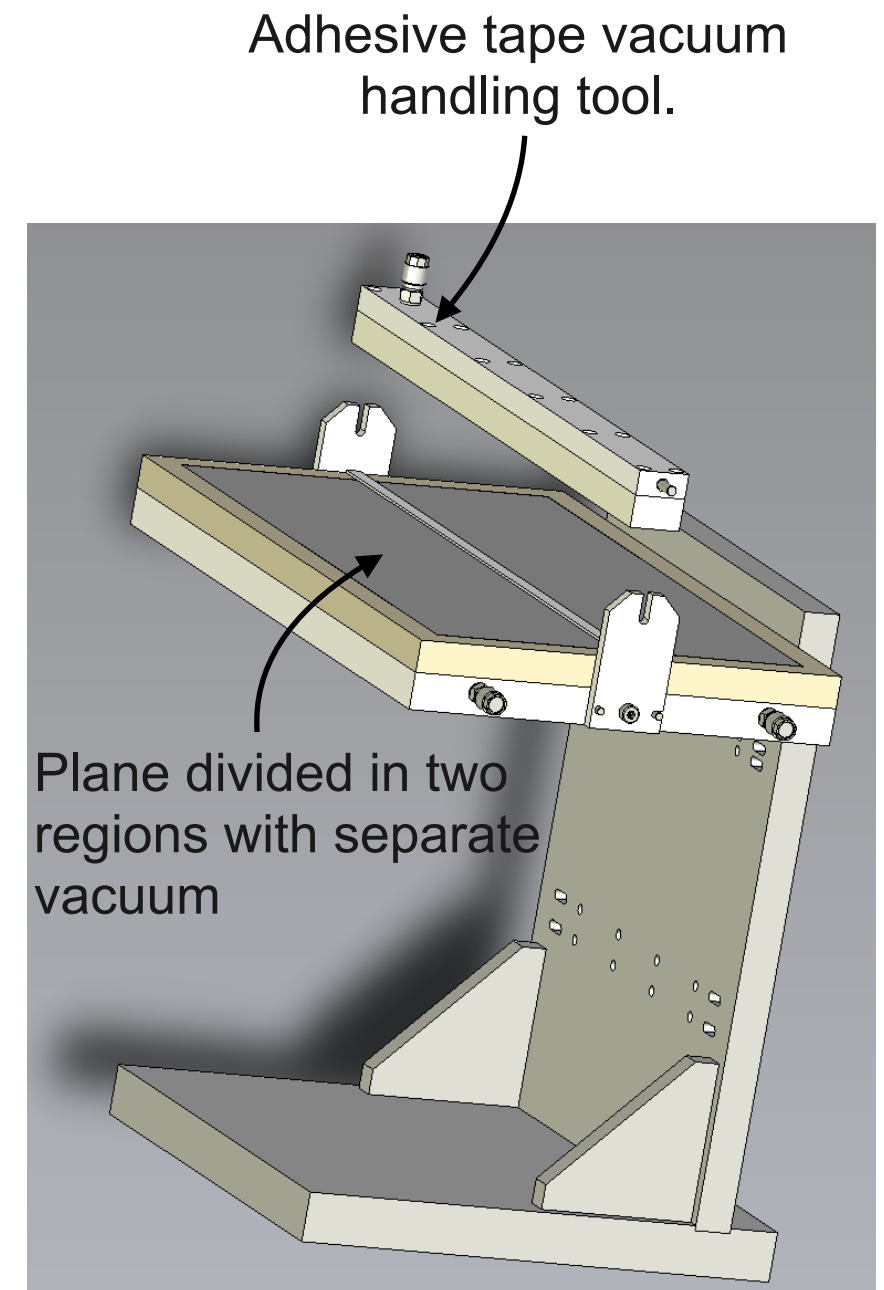
# Recent progresses

## Sensors alignment and handling tools



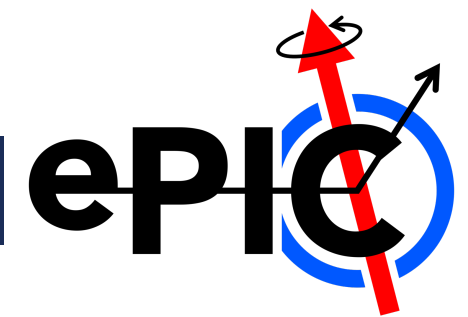
Required to:

- Precisely align and join the two sensors
- Handle the joint sensors during the bending procedure to approach the mandrel





# Prototyping campaign vs Material procurement



Prototype	Components	Goal	
MAR 2025	IBL01_P1 (half-layer)	<ul style="list-style-type: none"> <li>2 naked silicon L1 sensors</li> <li>L1 local support structure (3-D printed)</li> <li>outer support shell (machined in PEEK)</li> </ul>	<ul style="list-style-type: none"> <li>finalize half-layer assembly procedure</li> </ul>
	IBL01_P2 (half-barrel)	<ul style="list-style-type: none"> <li>IBL01_P1 +</li> <li>2 naked silicon L0 sensors</li> <li>L0 local support structure (3-D printed)</li> </ul>	<ul style="list-style-type: none"> <li>finalize half-barrel assembly procedure</li> </ul>
JUL 2025	IBL01_P3 (half-layer)	<ul style="list-style-type: none"> <li>2 naked silicon L1 sensors</li> <li>L1 local support structure (carbon foam)</li> <li>outer support shell (carbon fiber, to be defined)</li> </ul>	<ul style="list-style-type: none"> <li>thermal chamber test</li> </ul>
	IBL01_P4 (half-barrel)	<ul style="list-style-type: none"> <li>IBL01_P3 +</li> <li>2 naked silicon L0 sensors</li> <li>L0 local support structure (carbon foam)</li> </ul>	<ul style="list-style-type: none"> <li>thermal chamber test</li> </ul>
OCT 2025	IBL01_P5 (half-barrel)	<ul style="list-style-type: none"> <li>2+2 silicon L0+L1 sensors with heaters from CERN</li> <li>L0+L1 local support structures (carbon foam)</li> <li>outer support shell (carbon fiber, to be defined)</li> <li>air distribution inlet et outlet (to be designed)</li> <li>PT1000 sensors (to be glued on heater surface)</li> </ul>	<ul style="list-style-type: none"> <li>wind tunnel test</li> </ul>
		IBL01_P5 requires: <ul style="list-style-type: none"> <li>dummy silicon sensors with heaters</li> <li>air-cooling mechanism verification</li> <li>Possible preliminary FPC (mechanical) prototype to check volumes, transport etc)</li> <li>transport issues to wind tunnel facility</li> </ul>	

L0/L1 Silicon pieces  
SS 3D printed

L0/L1 Silicon pieces  
SS carbon fibre/foam

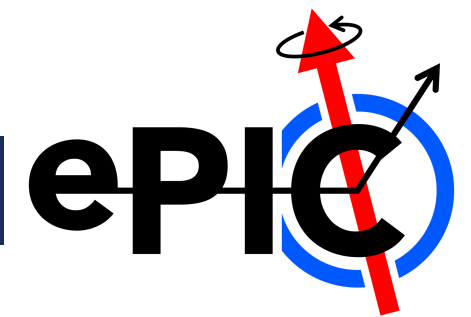
L0/L1 heaters  
SS carbon fibre/foam

Prototype	Components	Goal	Date
IBL012_P6/7	<ul style="list-style-type: none"> <li>2+2+4 ER2 pad wafer L0+L1+L2 sensors (x 2 HB?)</li> <li>L0+L1+L2 local support structures</li> <li>global support mechanics (advanced design)</li> <li>FPCs (advanced design)</li> <li>air distribution inlet &amp; outlet (advanced design)</li> </ul>	<ul style="list-style-type: none"> <li>first complete IB HB prototype w/o sensors</li> <li>including test of wirebonding to FPCs</li> <li>final test on HB support mechanics</li> <li>possibly built 2 complete HBs (to allow HB mechanical support matching test)</li> </ul>	2026/07
IBL012_P8	<ul style="list-style-type: none"> <li>2+2+4 ER2 wafer L0+L1+L2 sensors</li> <li>L0+L1+L2 local support structures</li> <li>mechanics, FPCs, cooling (~final/advanced design)</li> </ul>	<ul style="list-style-type: none"> <li>complete IB HB prototype w/ sensors</li> <li>qualification model w/ bent sensors for cooling + powering/DAQ/DCS finalisation</li> </ul>	2026/10

L0/L1 pad sensors  
SS carbon fibre/foam

L0/L1 ER2 sensors  
SS carbon fibre/foam

# Prototyping campaign vs Material procurement



## Silicon sensors:

Silicon pieces	4 L0 - 4 L1	AVAILABLE No spares
Heaters	2 L0 - 2 L1	Under production at CERN (Rui team) Foreseen: 4 L0 - 4 L1
Pad sensors	[ 2 L0 - 2 L1 - (4 L2) ] x 2	If two half-barrels (16 pad sensors = 16 wafers) → no spares
ER2 sensors	2 L0 - 2 L1 - (4 L2)	Only one half-barrel No spares

## Support structures:

3D printed	Many...	Actually mixing printed and manufactured in very first exercises
Carbon fibre/foam	Many...	<p>Design and material to be established (foam for half-rings and fibre for logerons)</p> <p>Foam procurement and shaping:</p> <ul style="list-style-type: none"> <li>- Genova INFN → To be explored</li> <li>- Berkley (Nikki) → Expressed availability</li> <li>- U.K. (George) → Expressed availability</li> </ul> <p>Carbon fibre production:</p> <ul style="list-style-type: none"> <li>- producer to be identified...</li> </ul>