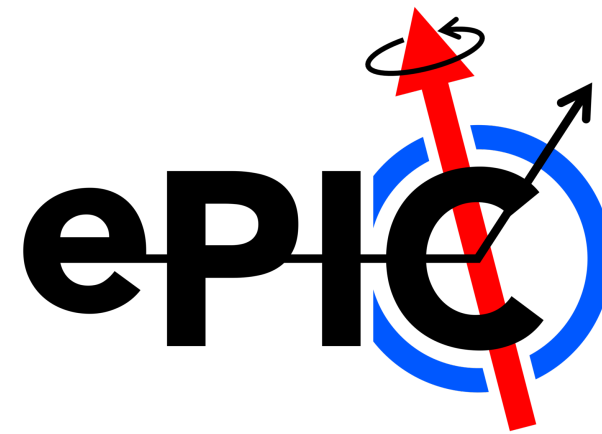




Bending and assembly of the L0 and L1 layers

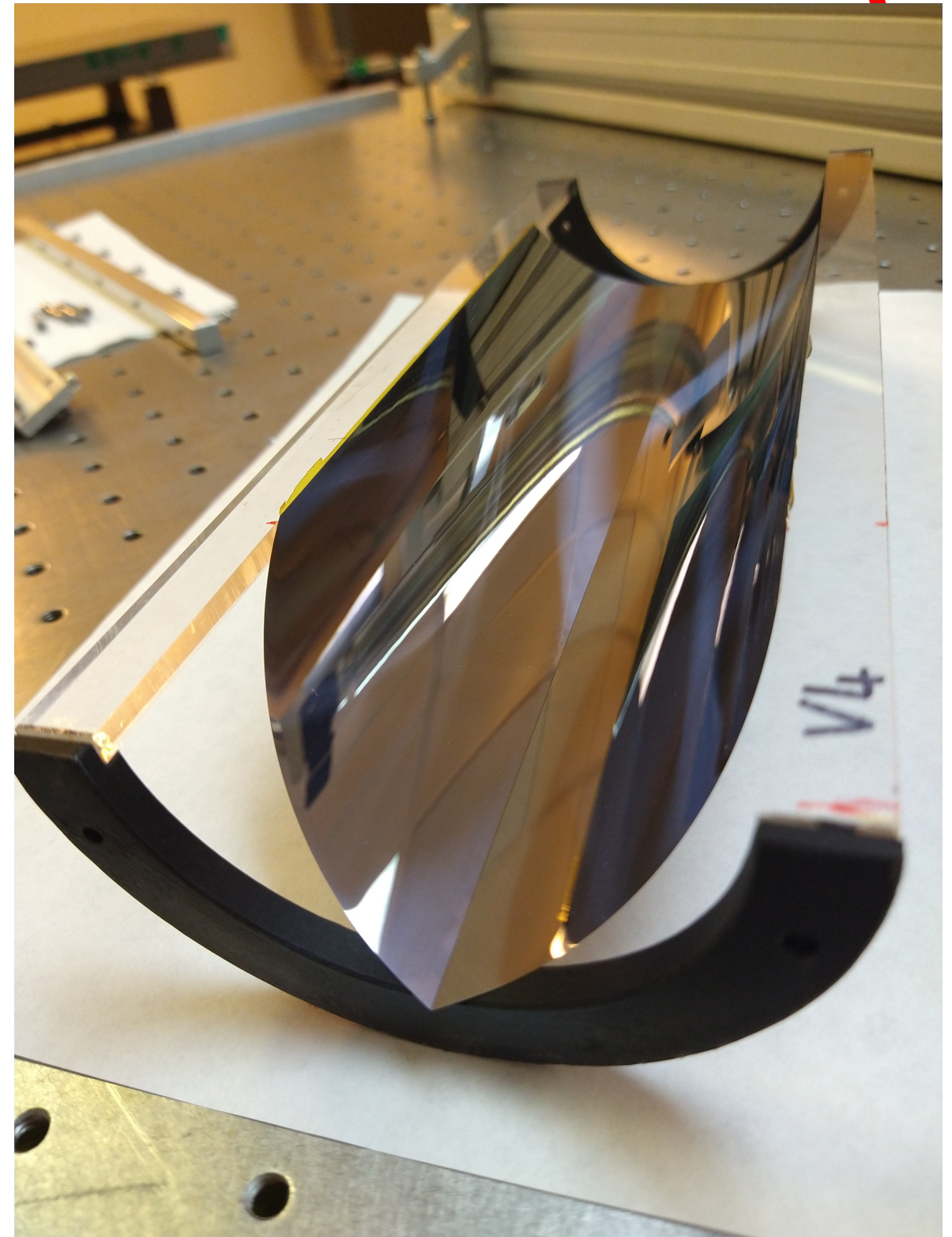
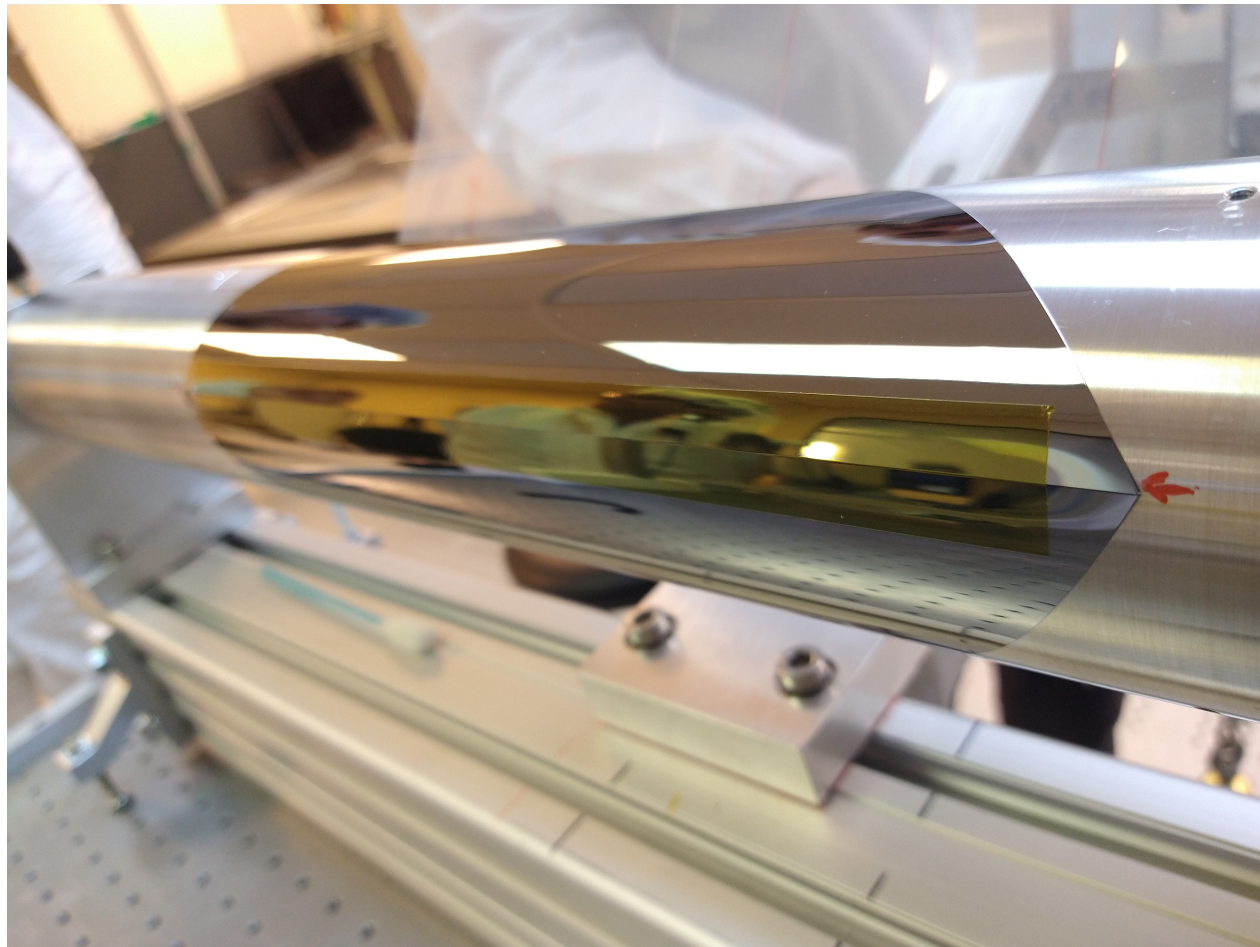
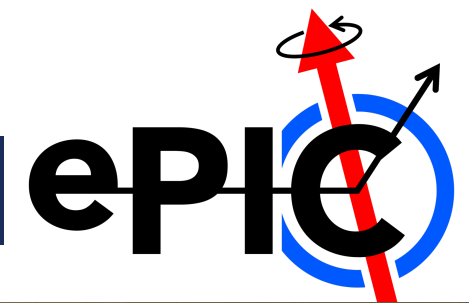
SVT Bari team

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

1. SVT-L0 half-layer attempt n. 4
2. SVT-L0 half-layer summary table
3. Next steps
4. Prototyping campaign and material procurement

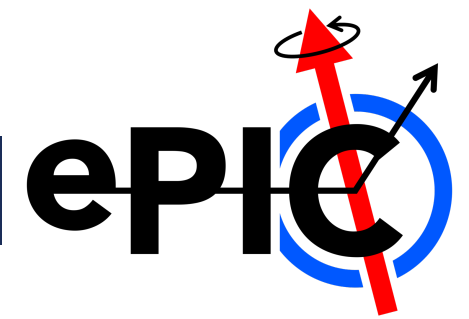
Recent progresses

SVT-L0 half-layer attempt n. 4



Recent progresses

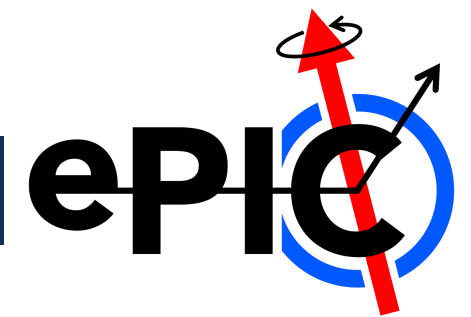
SVT-L0 half-layer attempts summary



Attempts #	Conditions	Dates	Success	Notes
1	2 half-moon shaped L0 3D printed longerons and half-rings mandrel produced on our workshop	25/11/2024 - 26/11/2024	NO	Breakage of the second silicon piece during the bending
2	2 half-moon shaped L0 3D printed half-rings and plexiglass longerons mandrel produced on our workshop	13/01/2025 - 31/01/2025	YES	
3	2 half-moon shaped L0 3D printed half-rings and plexiglass longerons mandrel produced on our workshop	24/03/2025 - 28/03/2025	NO	One silicon piece already broken from the transport box
4	2 half-moon shaped L0 3D printed half-rings and plexiglass longerons mandrel produced on our workshop	03/04/2025 - 10/04/2025	YES	

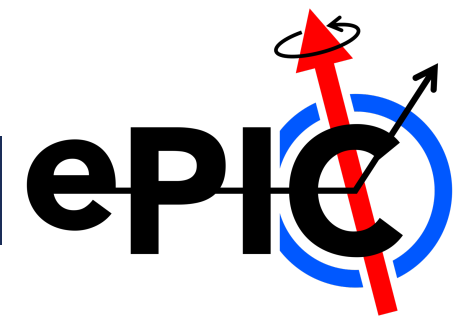
Recent progresses

SVT-L0 half-layer attempts summary



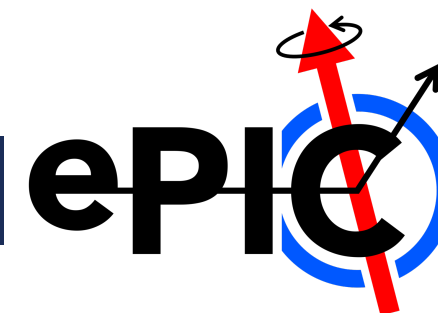
Recent progresses

Next steps



- SVT-L1 half-layer
- (If previous step successful) SVT-L0L1 half-barrel
- Few small features to be added to the handling and gluing tools
 - Better vacuum on movable tower
 - Better longerons handling during gluing
 - Sensor pitch measurement improvement and automatization

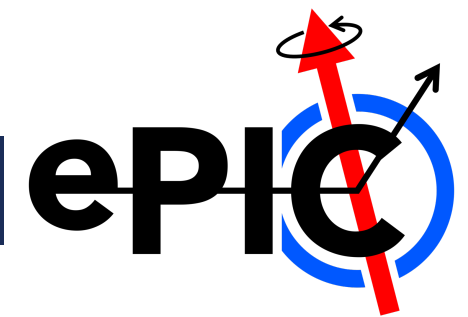
Prototyping campaign vs Material procurement



	Prototype	Components	Goal	
MAR 2025	IBL01_P1 (half-layer)	2 naked silicon L1 sensors - L1 local support structure (3-D printed) - outer support shell (machined in PEEK)	finalize half-layer assembly procedure	They require dummy silicon sensors from DISCO; to validate 2-sensor connection and bending, to design local support structure, external shell etc → L0/L1 Silicon pieces SS 3D printed Outer shell ??
	IBL01_P2 (half-barrel)	- IBL01_P1 + 2 naked silicon L0 sensors - L0 local support structure (3-D printed)	finalize half-barrel assembly procedure	
JUL 2025	IBL01_P3 (half-layer)	2 naked silicon L1 sensors - L1 local support structure (carbon foam) - outer support shell (carbon fiber, to be defined)	thermal chamber test	In addition to DISCO dummies, they require: - carbon foam local support (procurement and machining TBD) - carbon fiber outer support shell TBD (if yes, needs for design&simulation, procurement and machining) → L0/L1 Silicon pieces SS carbon foam Outer shell carbon fibre
	IBL01_P4 (half-barrel)	- IBL01_P3 + 2 naked silicon L0 sensors - L0 local support structure (carbon foam)	thermal chamber test	
OCT 2025	IBL01_P5 (half-barrel)	2+2 silicon L0+L1 sensors with heaters from CERN - L0+L1 local support structures (carbon foam) - outer support shell (carbon fiber, to be defined) - air distribution inlet et outlet (to be designed) - PT1000 sensors (to be glued on heater surface)	wind tunnel test	→ L0/L1 heaters SS carbon foam Outer shell carbon fibre IBL01_P5 requires: - dummy silicon sensors with heaters - air-cooling mechanism verification - Possible preliminary FPC (mechanical) prototype to check volumes, transport etc) - transport issues to wind tunnel facility

Prototype	Components	Goal	Date	
IBL012_P6/7	2+2+4 ER2 pad wafer L0+L1+L2 sensors (x 2 HB?) - L0+L1+L2 local support structures - global support mechanics (advanced design) - FPCs (advanced design) - air distribution inlet & outlet (advanced design)	- first complete IB HB prototype w/o sensors - including test of wirebonding to FPCs - final test on HB support mechanics - possibly built 2 complete HBs (to allow HB mechanical support matching test)	2026/07	→ L0/L1 pad sensors SS carbon foam Outer shell carbon fibre
IBL012_P8	2+2+4 ER2 wafer L0+L1+L2 sensors - L0+L1+L2 local support structures - mechanics, FPCs, cooling (~final/advanced design)	- complete IB HB prototype w/ sensors - qualification model w/ bent sensors for cooling + powering/DAQ/DCS finalisation	2026/10	→ L0/L1 ER2 sensors SS carbon foam Outer shell carbon fibre

Prototyping campaign vs Material procurement



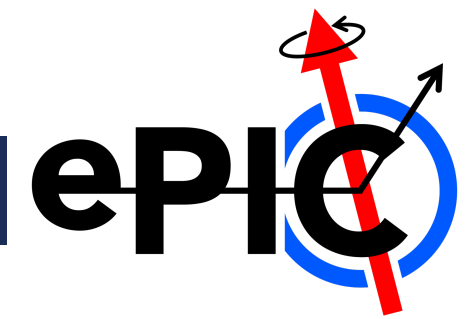
Silicon sensors/pieces:

Silicon pieces	4 L0 - 4 L1	AVAILABLE No spares
Heaters	2 L0 - 2 L1	Production completed: 4 L0 - 4 L1 Partially to be called from CERN
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:

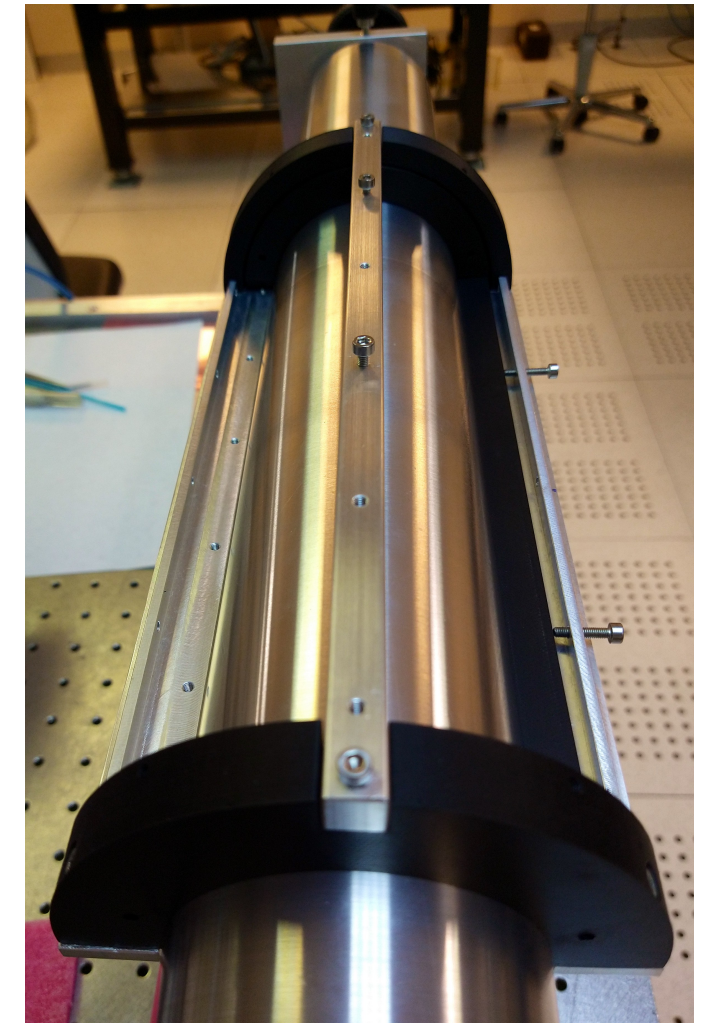
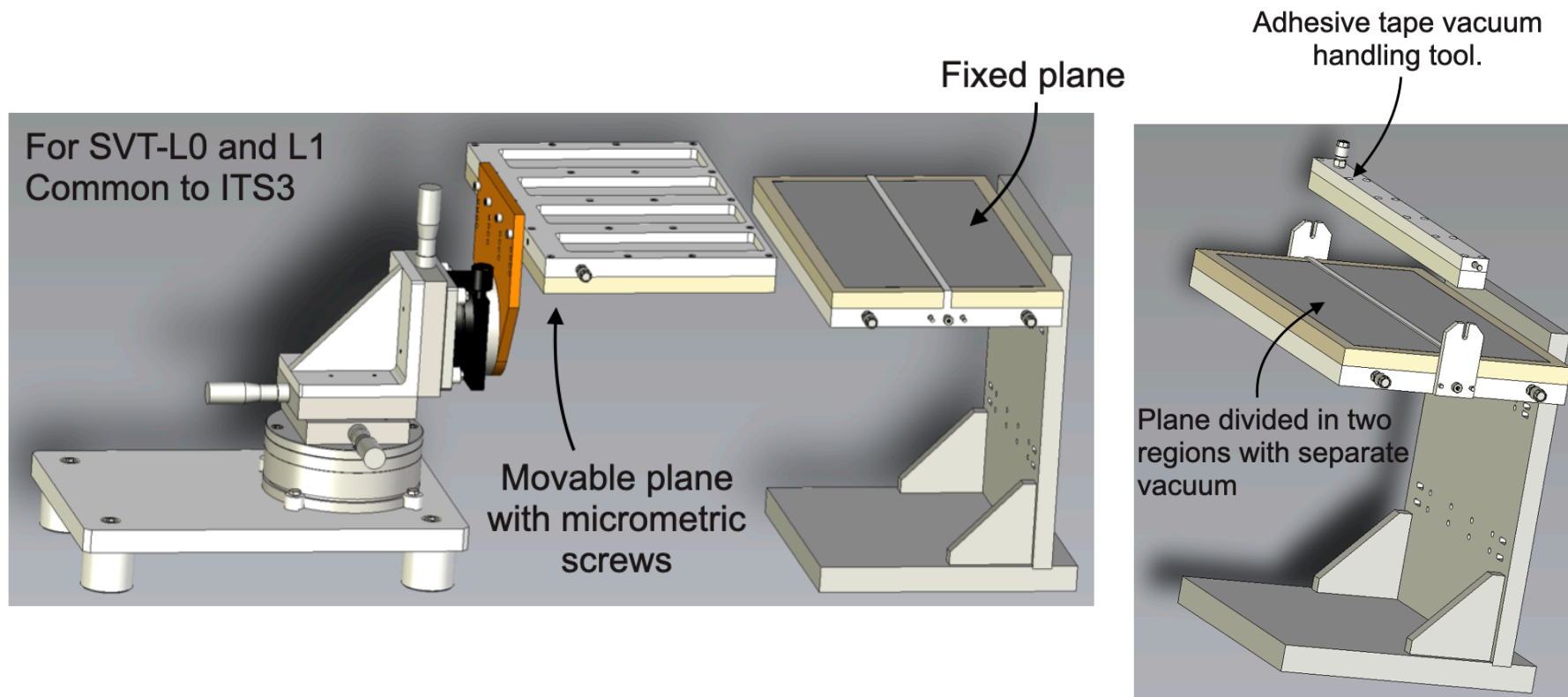
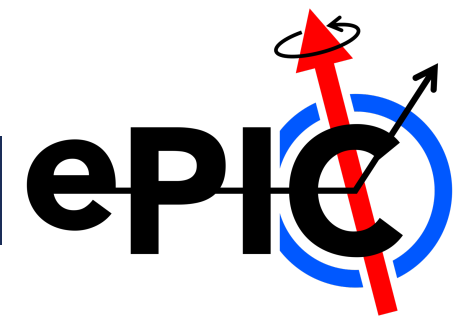
3D printed	Mixing printed and manufactured in very first exercises
Carbon fibre/foam	<u>Material for components</u> - Half-ring on LEC: Allcomp K9 (standard density, 200-260 kg/m³) - Longerons and half-ring on REC: Carbon RVC Duocel (density 45 kg/m³, PPI 100) - Outer shell: carbon fibre → Type of carbon fibre to be defined (Padova) <u>Foam procurement</u> - Allcomp K9 → Not easy to procure from Europe, ask colleagues in USA - Carbon RVC Duocel → Company in USA, but possible purchasing from Europe <u>Foam shaping</u> - Collecting procedure details from CERN colleagues - Genova INFN → First contact, under exploration - Berkley (Nikki) or U.K. (George) → Expressed availability - Local workshop → To be found and require material for attempts <u>Carbon fibre production</u> - Producer to be identified (Padova)

BACKUP



Recent progresses

New sensor handling tools and support structure gluing tools

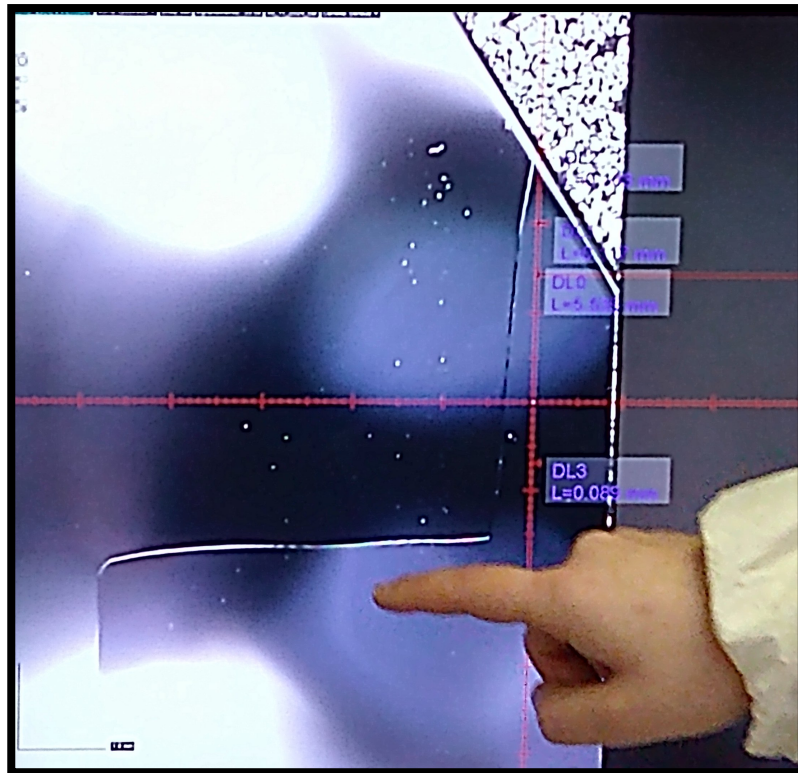
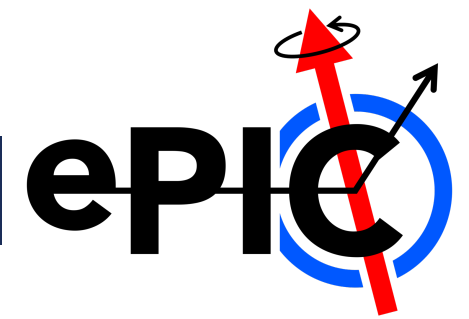


Required to:

- 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

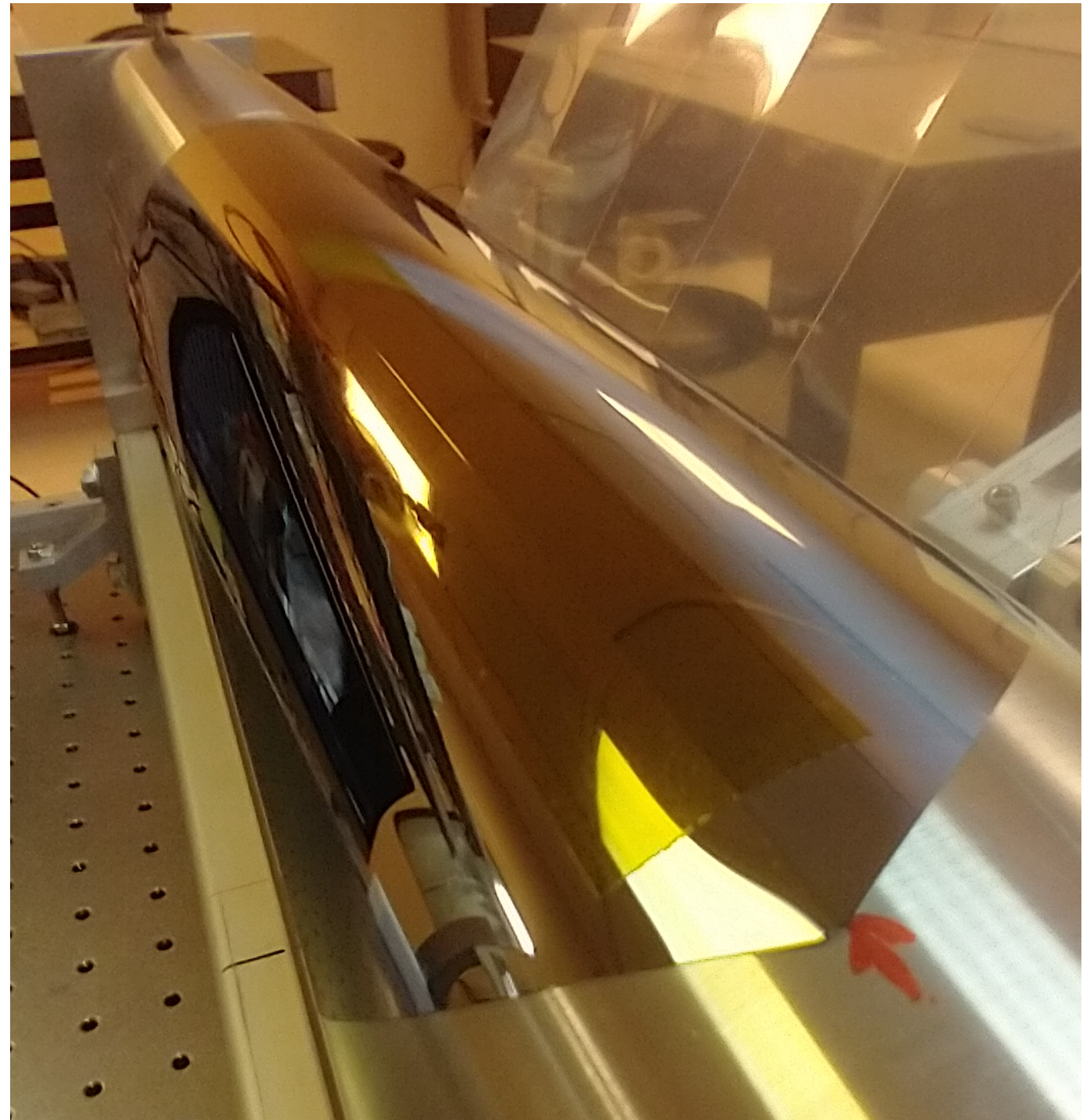


Crack stopped during bending procedures using microscope (not easily visible by eye).



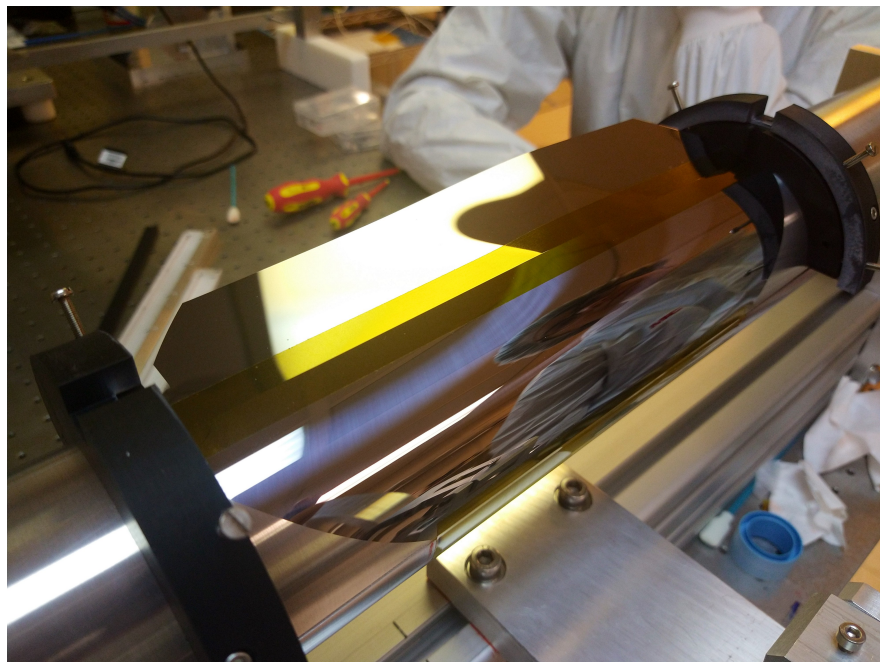
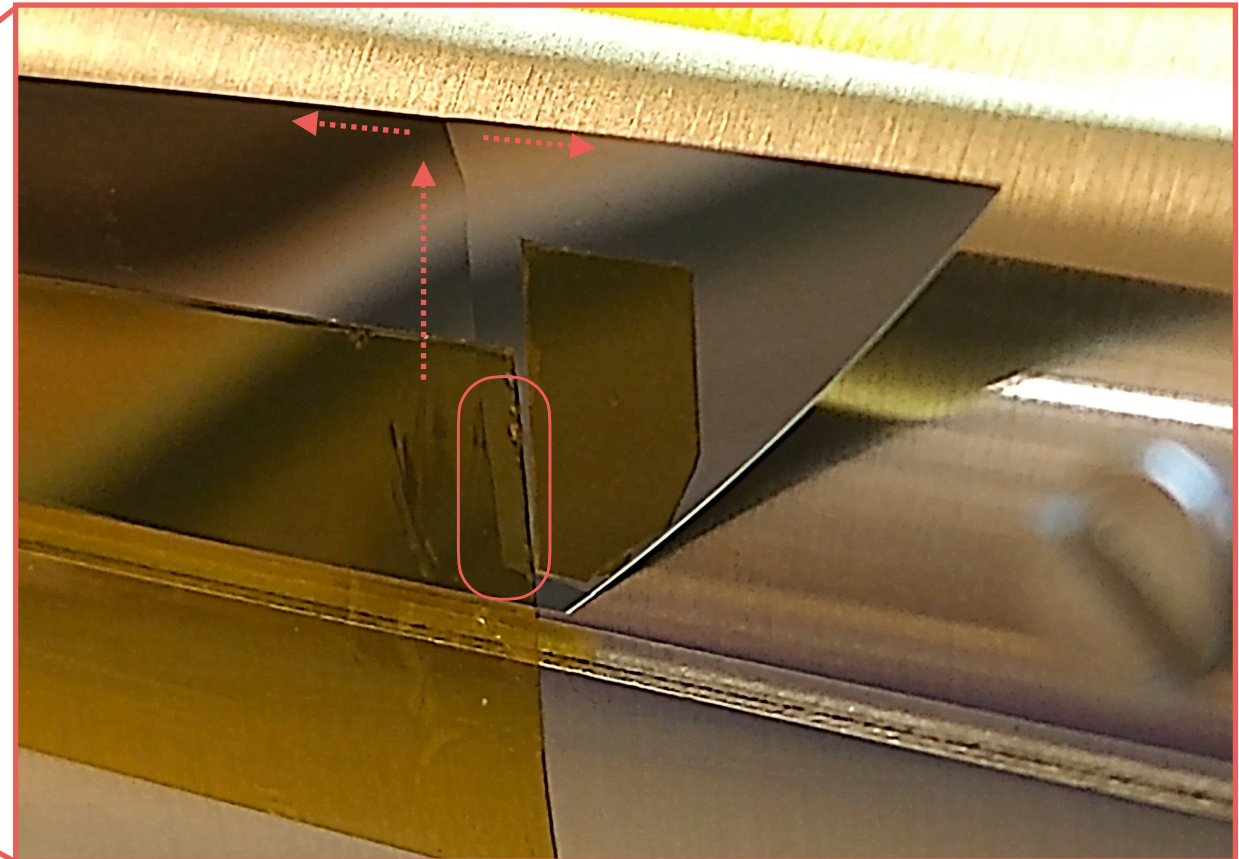
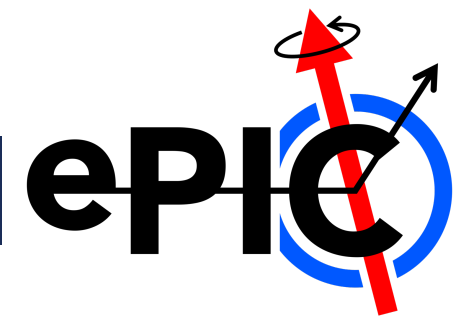
Broken silicon pipe found in the same box

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



Recent progresses

SVT-L0 half-layer attempt n. 3

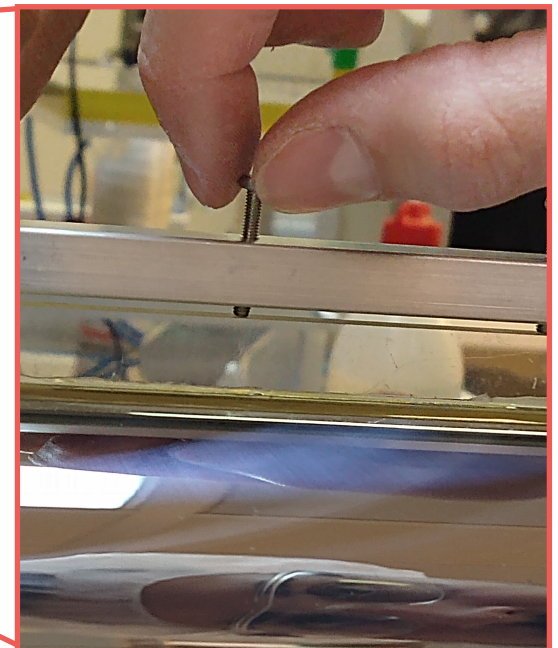
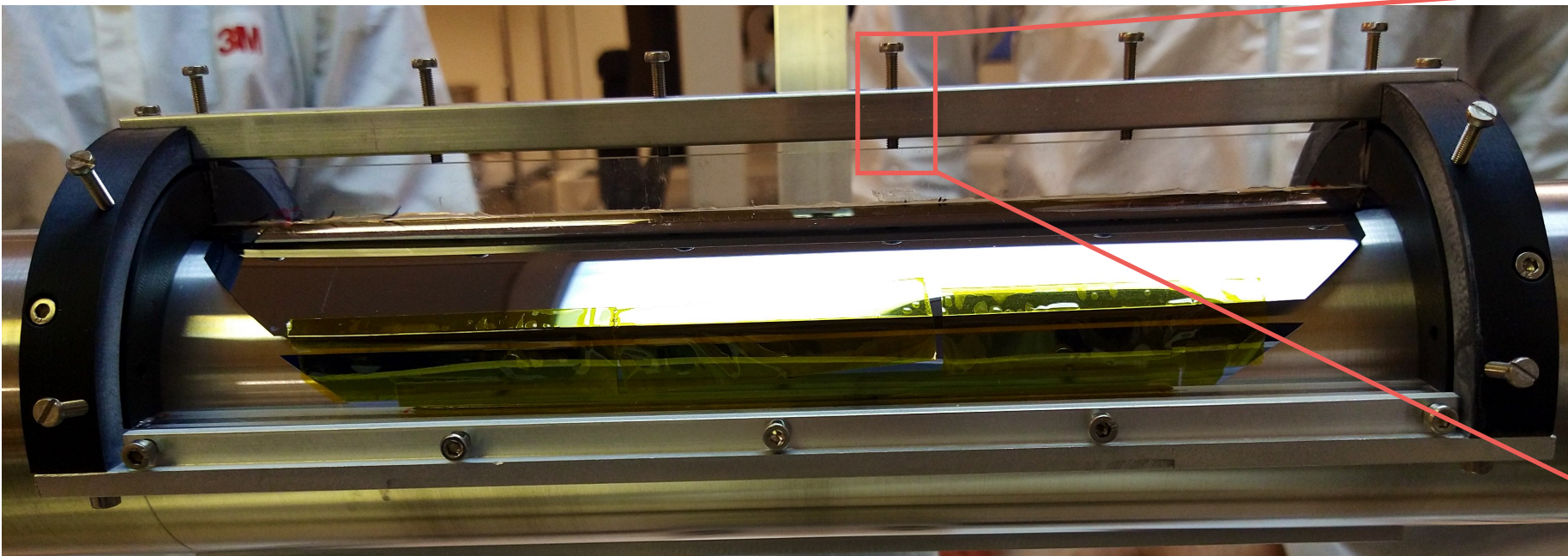
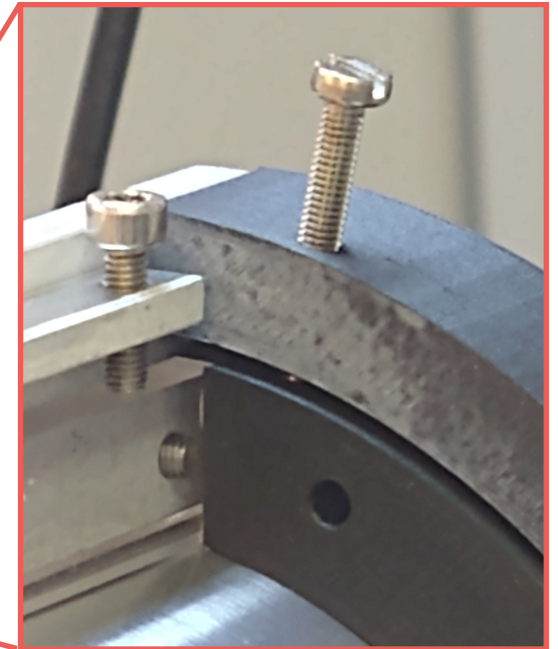
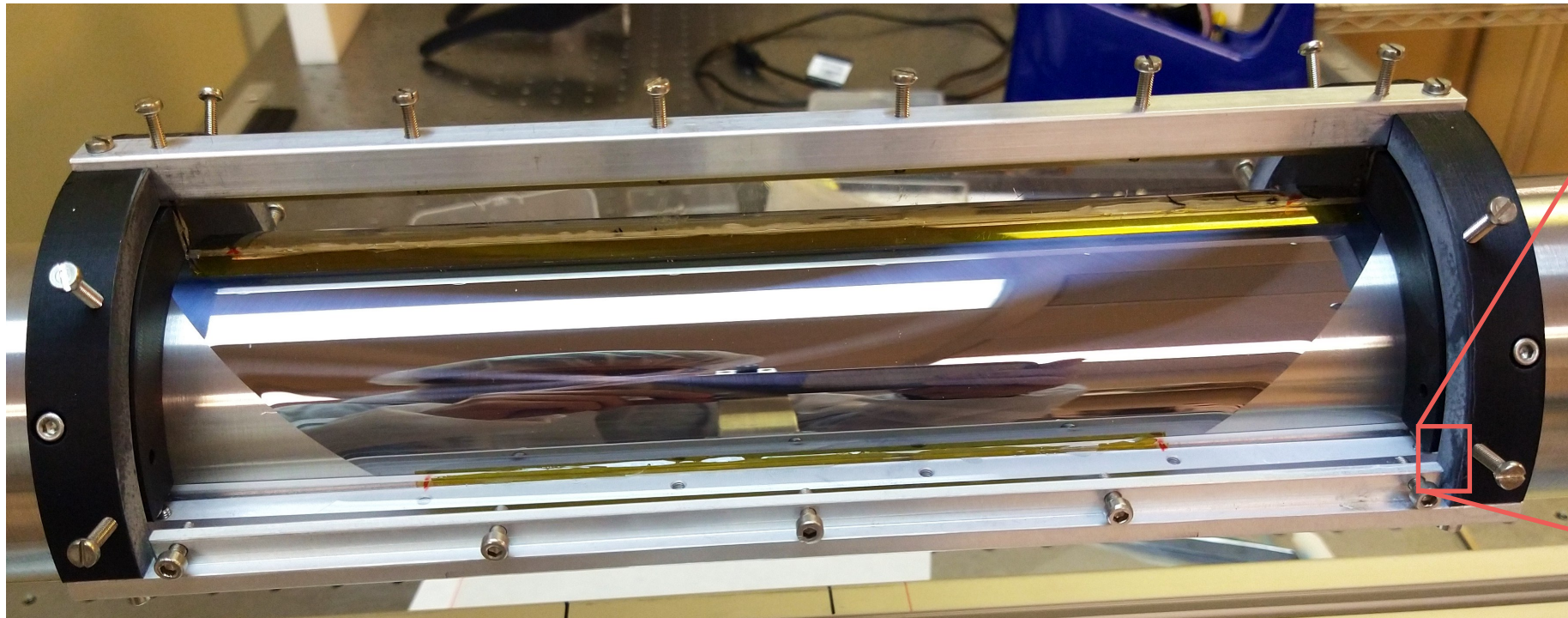
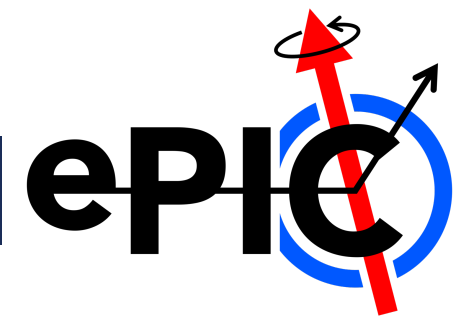


Fancy patchwork to finalize the exercise of verification of support structure gluing tools



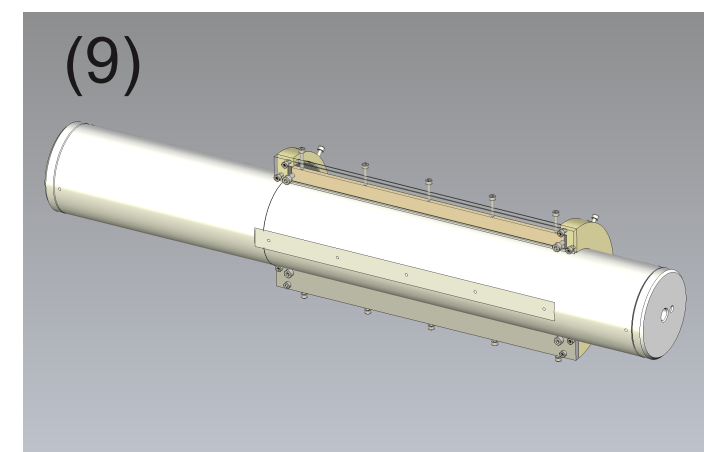
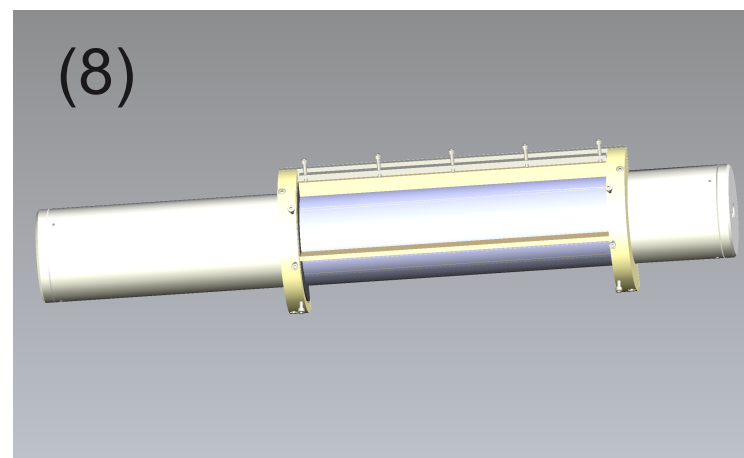
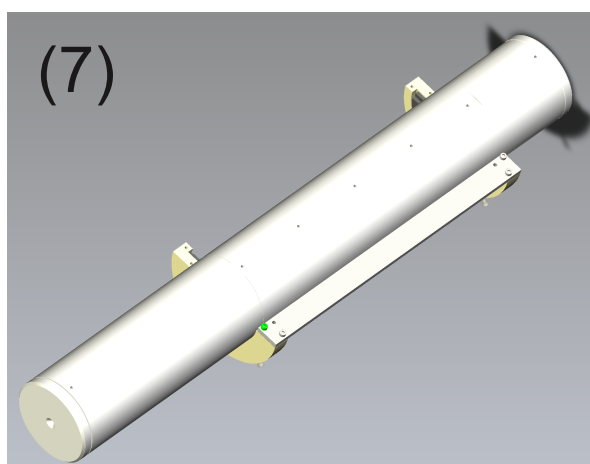
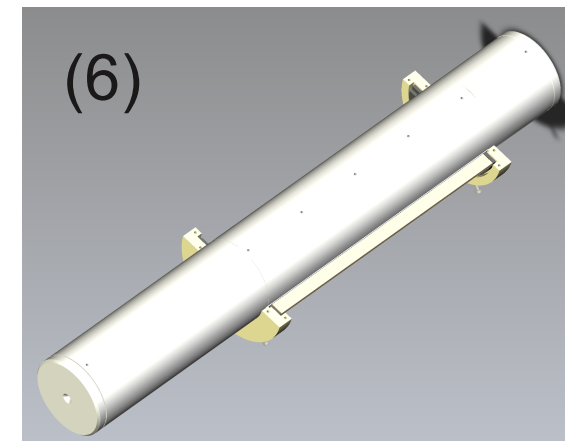
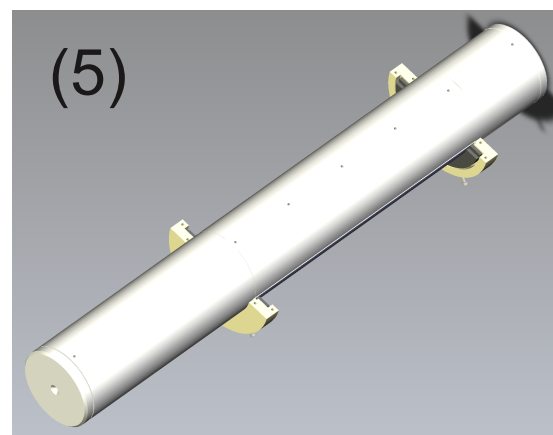
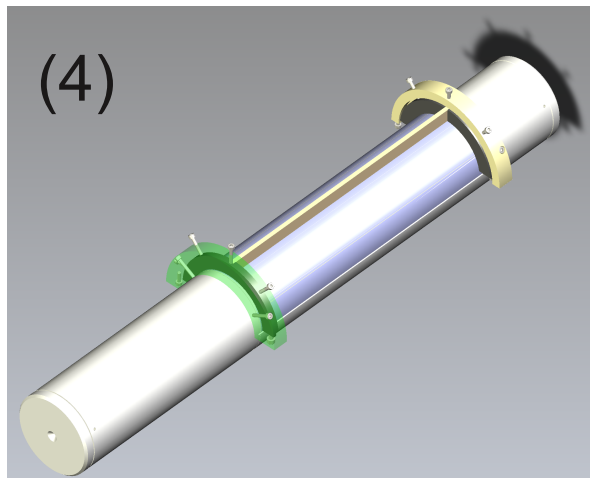
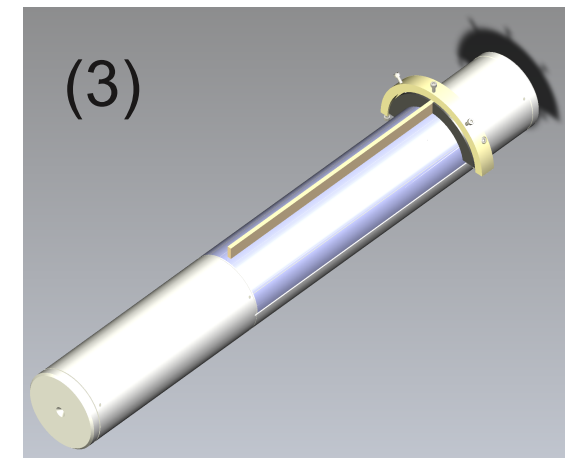
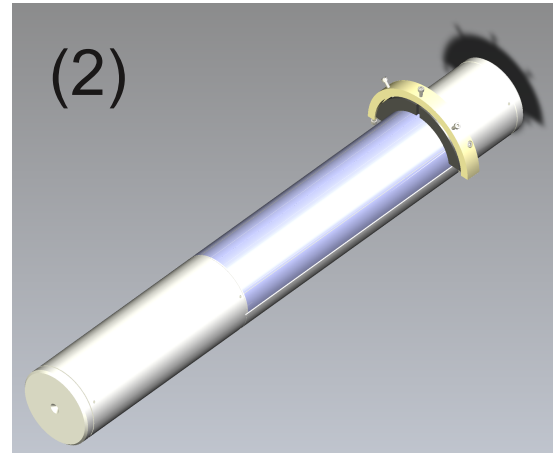
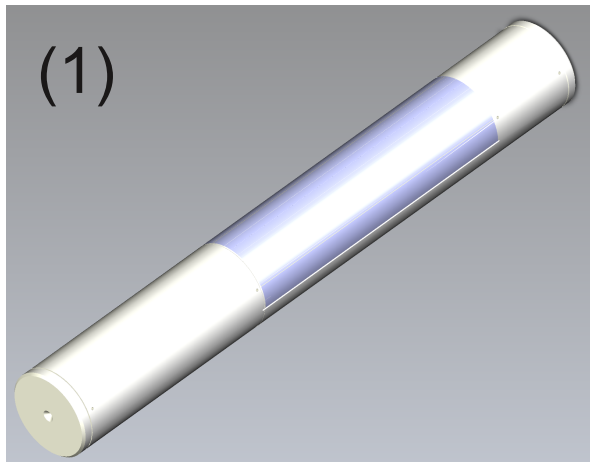
Recent progresses

SVT-L0 half-layer attempt n. 3



Recent progresses

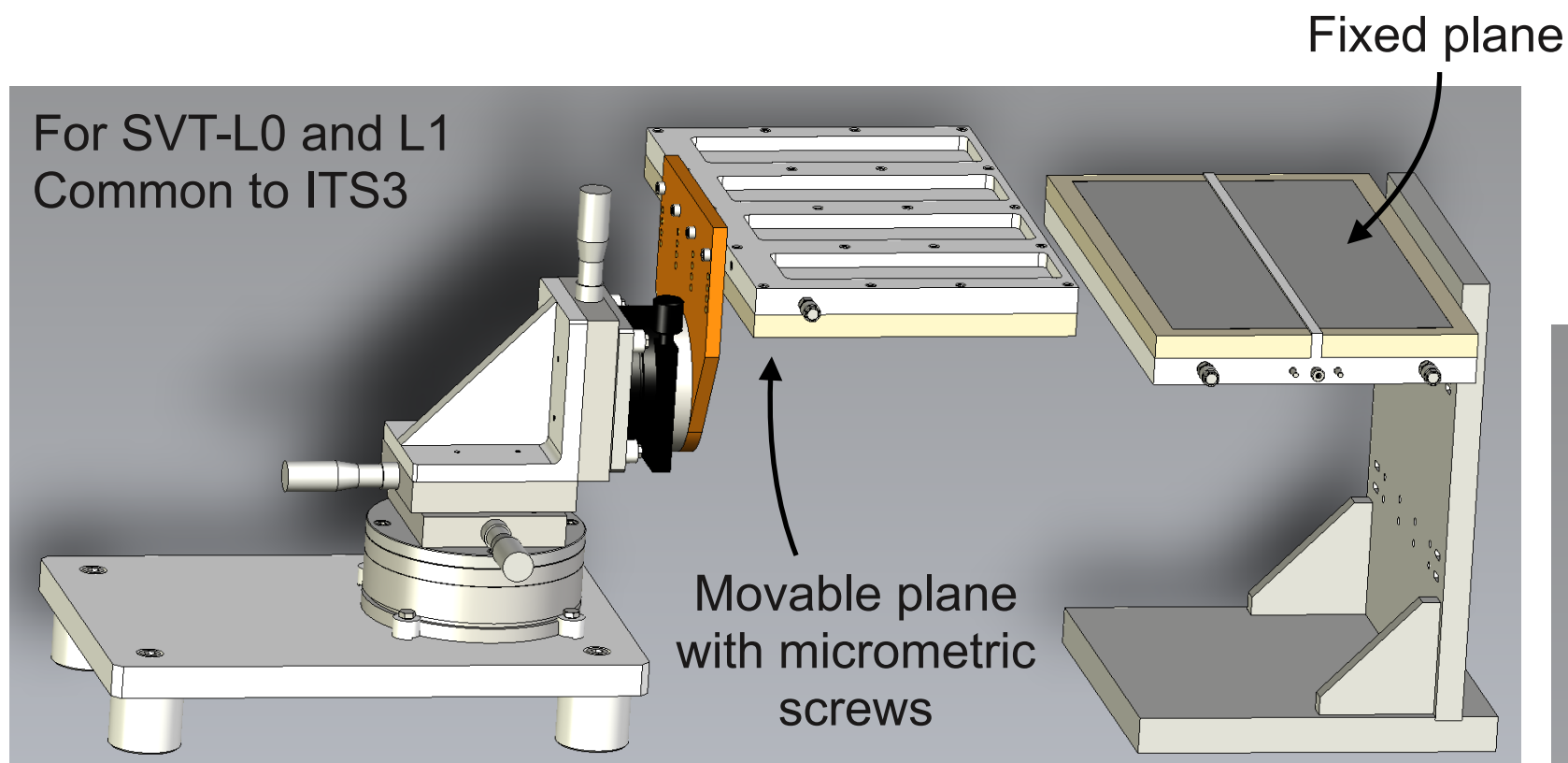
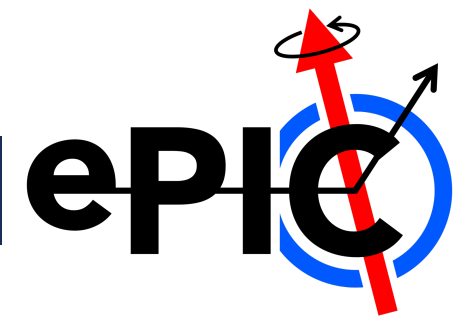
Support structures gluing tool



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

