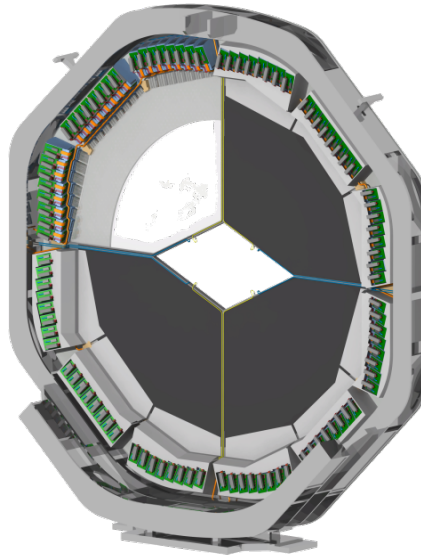


Gluing Tests for the PANDA Endcap Disc DIRC



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PANDA CM 18/1 | PID Cherenkov

2017/03/06

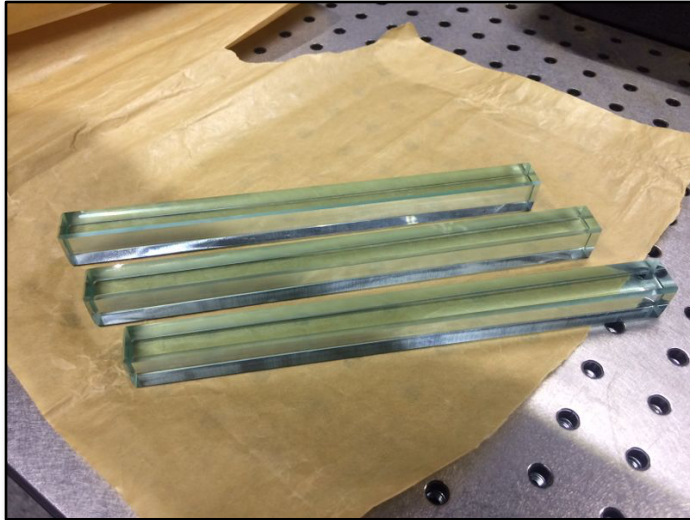
Goals and working plan

- Evaluate gluing procedure and stability of glue joint between radiator and ROMs
- Three different adhesives are being used:

	NOA-61	Epotek 301-2	APM-Epicol
Modulus [N/mm ²]	1000	3500	2600
Tensile [N/mm ²]	20	25	30
Viscosity [mPa*s]	300	225-425	100-200
Mixing Ratio	1k	10:3.5 (g/g)	10:3 (g/g)
Pot Time	-	8h	1h @25°C
Cure Time	UV	24h @25°C	18h @25°C
Refractive Index	1.56 @589 nm	1.53 @589 nm	1.55

- In addition it is planned to do our own measurements regarding the transmission and radiation hardness of these adhesives

Material



Float glass bars



Syringe accessories

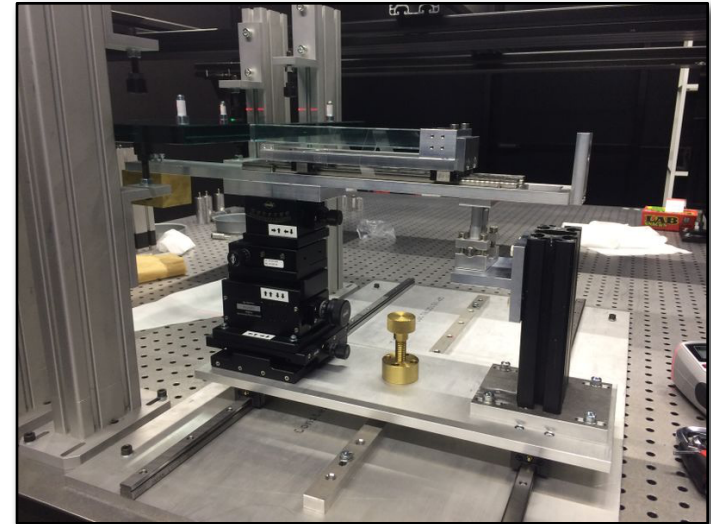
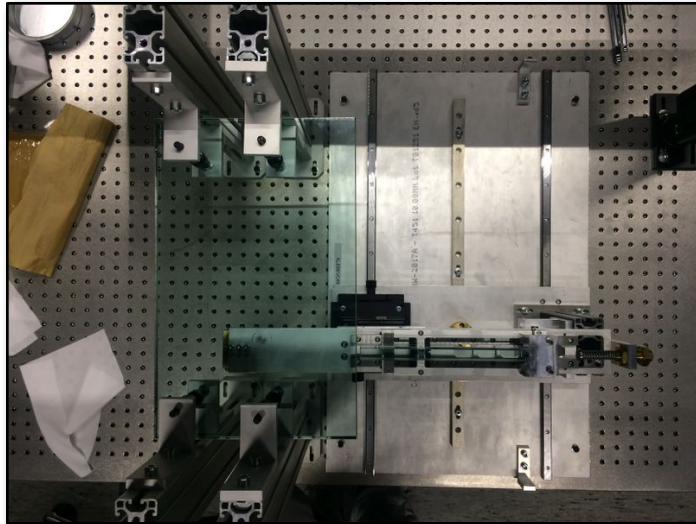
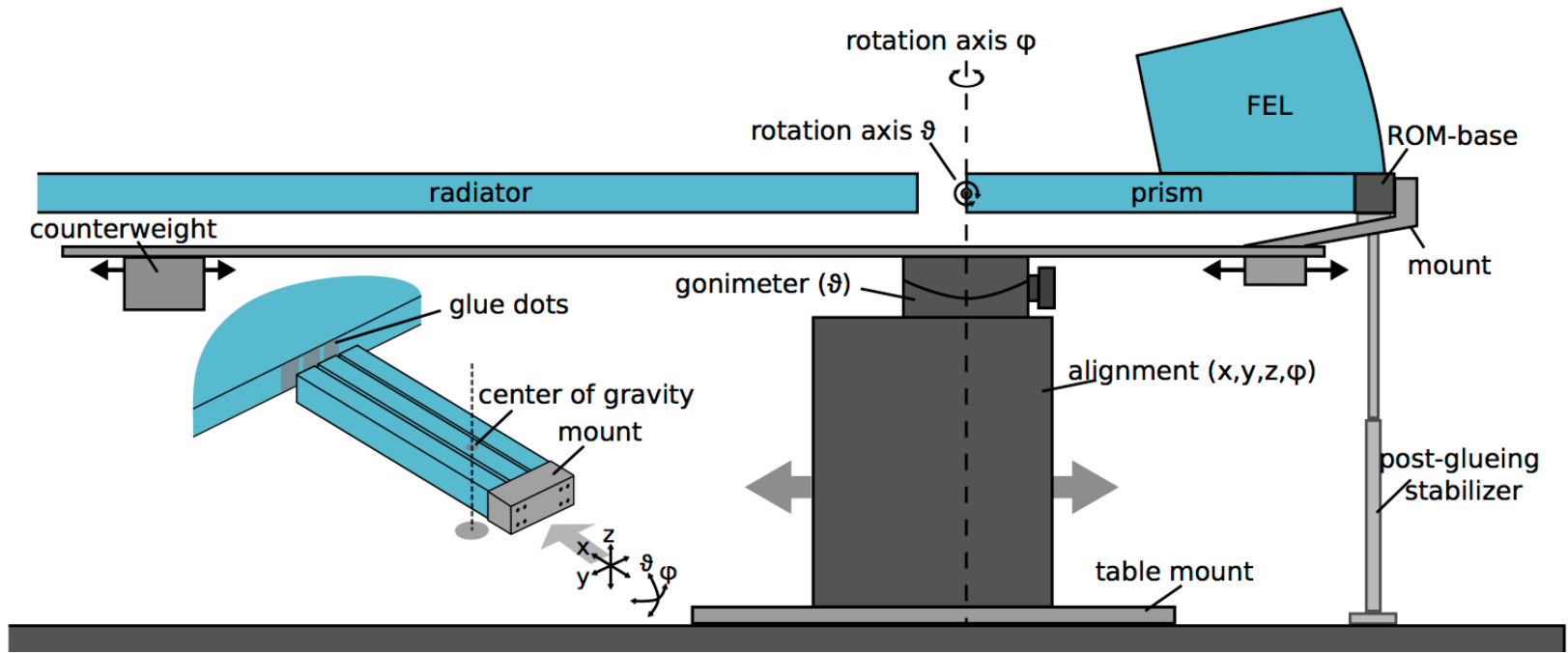


Teflon tape

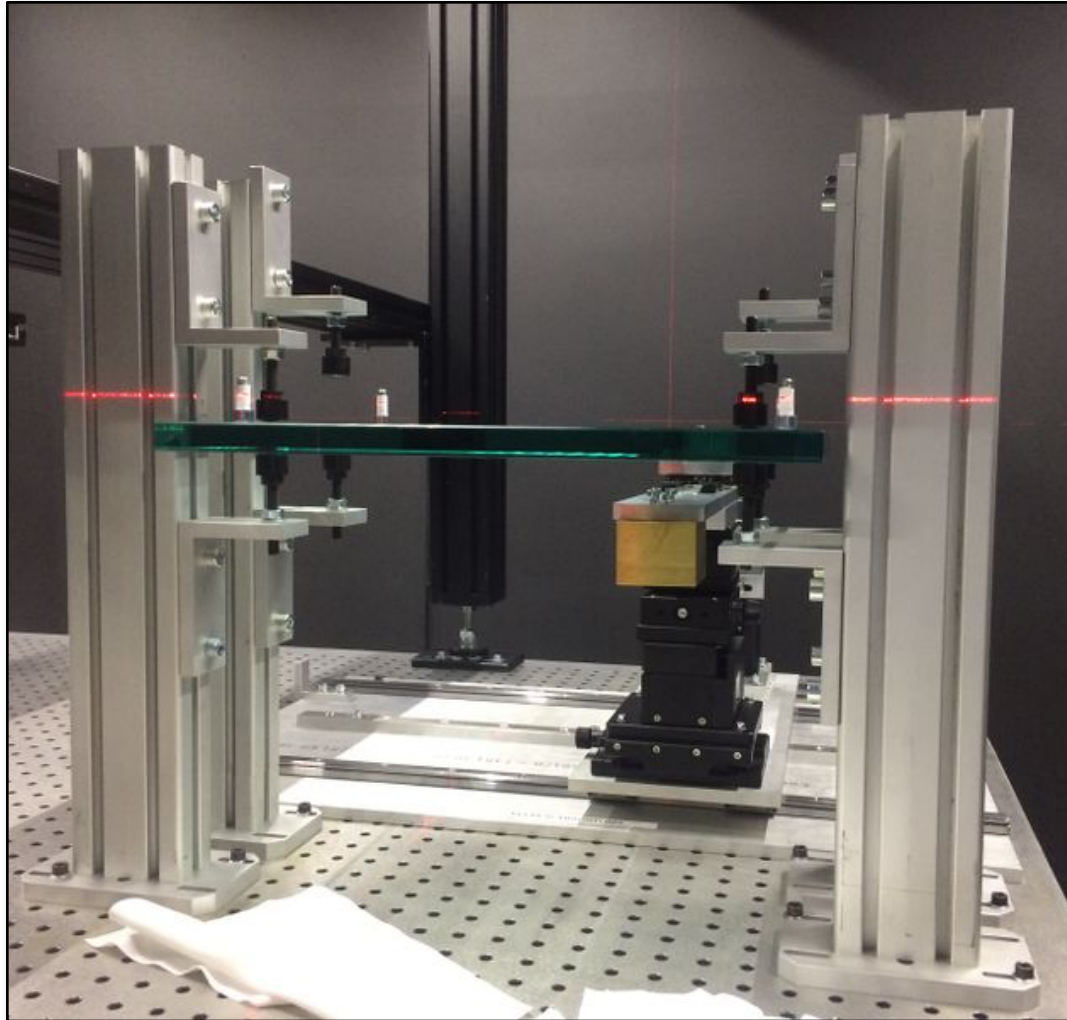


adhesives

Setup

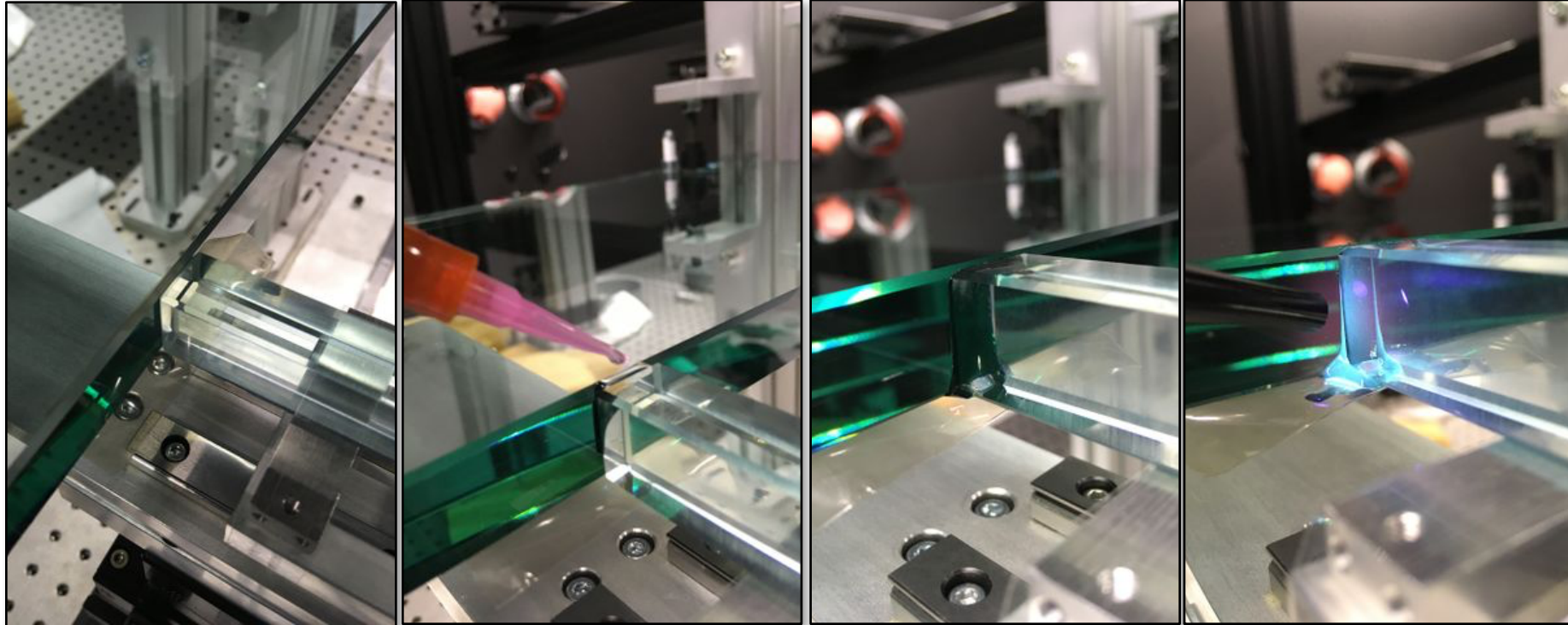


Setup



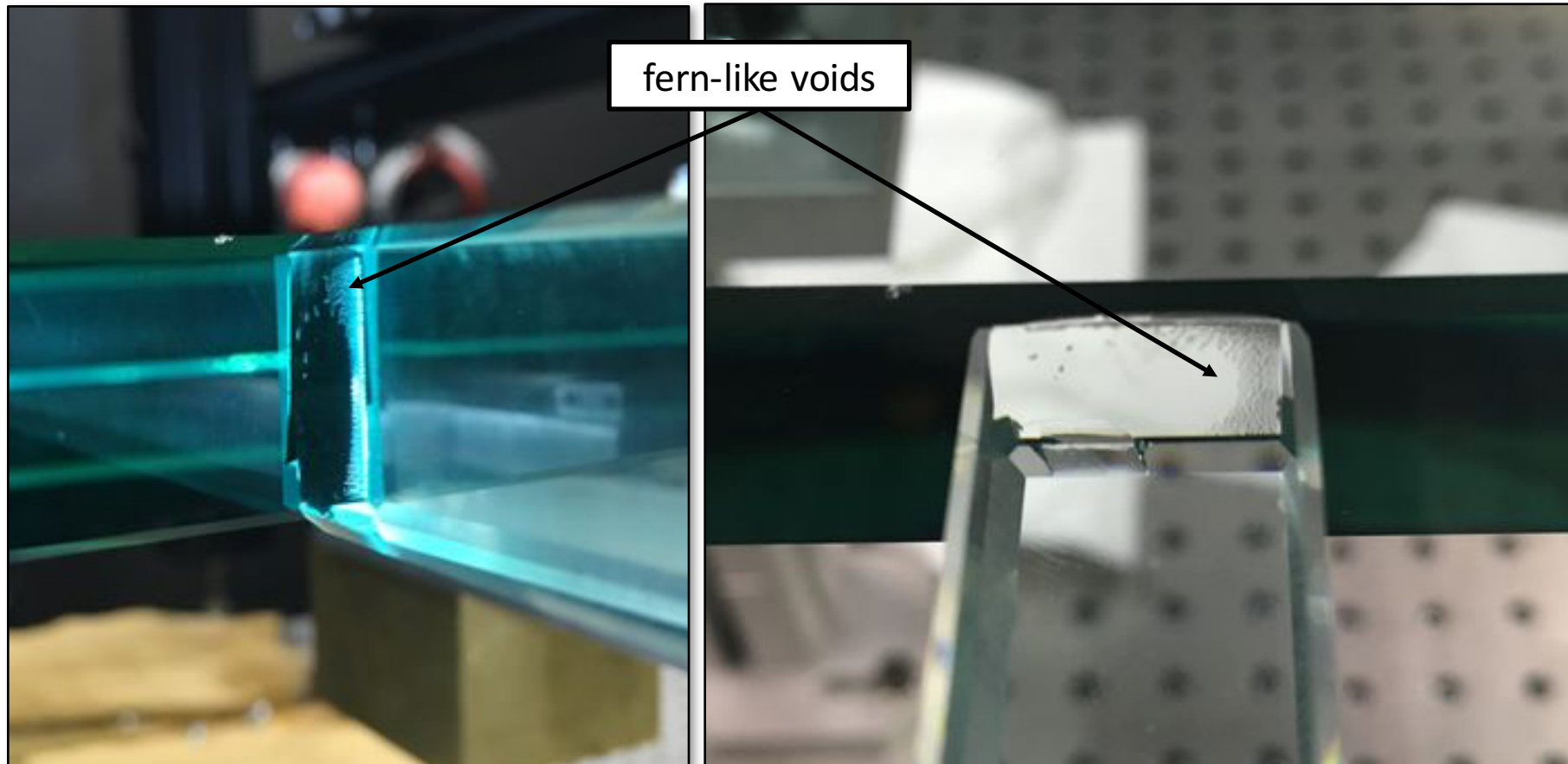
- Float glass radiator is leveled out with laser

Gluing with NOA-61



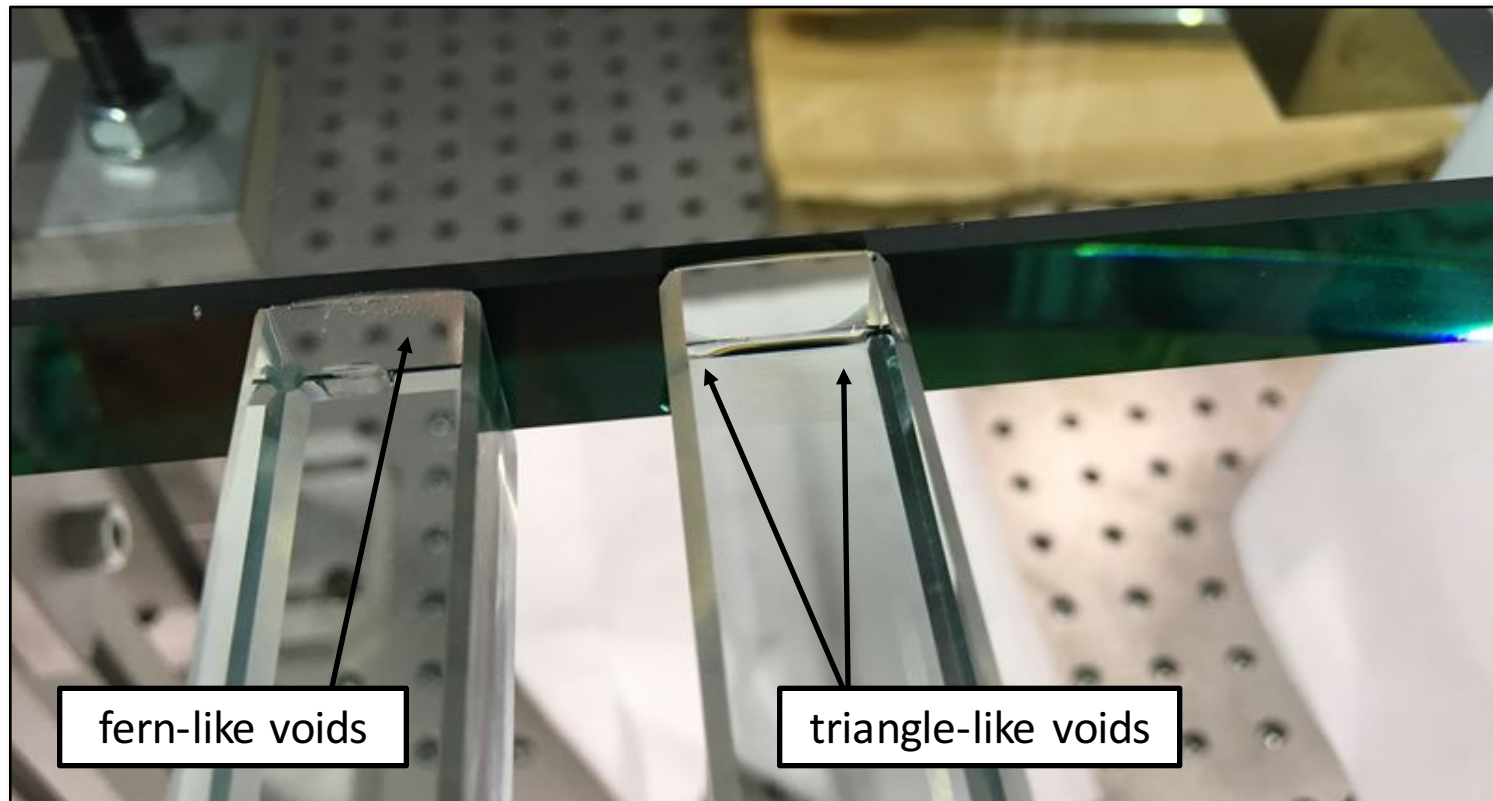
1. orientate bar with respect to radiator and adjust thickness of glue joint
2. apply glue through syringe
3. capillary forces pull glue into the gap
4. cure using a UV light source

Gluing with NOA-61



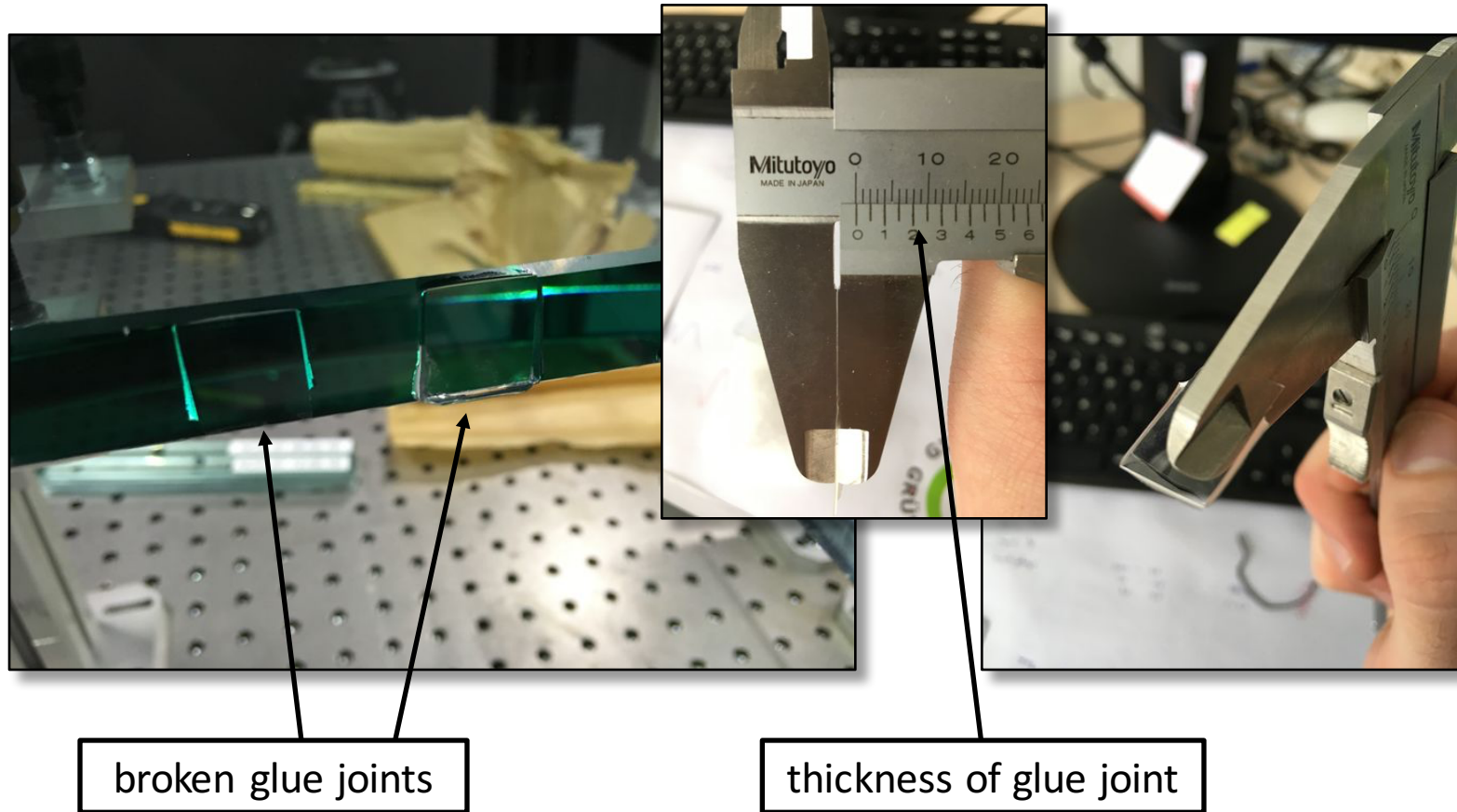
- Known failure which occurs when the cement pulls away from itself
- Probably caused by uneven curing

Gluing with NOA-61 (2nd try)



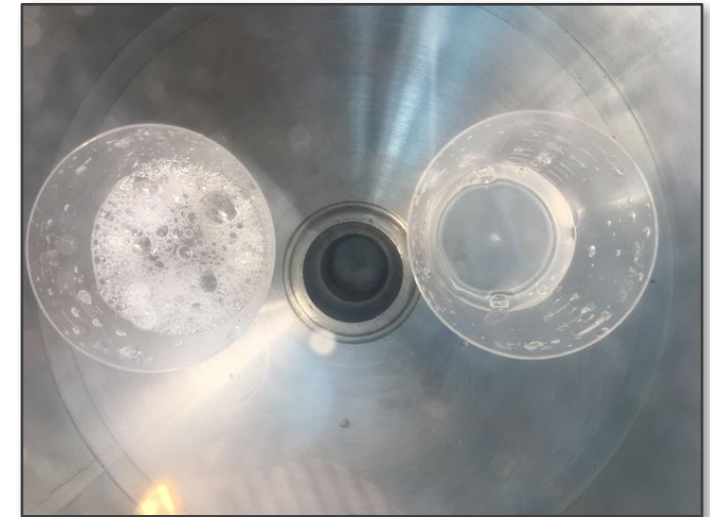
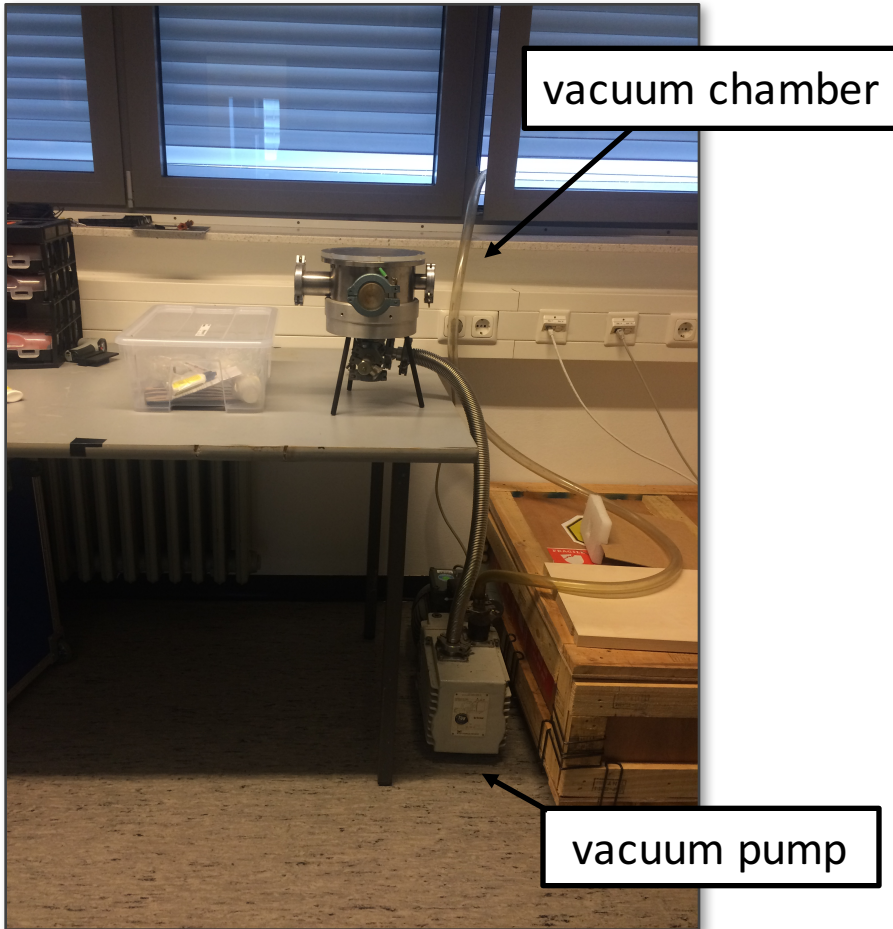
- In a second try problem could not be completely solved as two triangle-like structures at the bottom of the glue joint appeared

Gluing with NOA-61 (failure of glue joint)



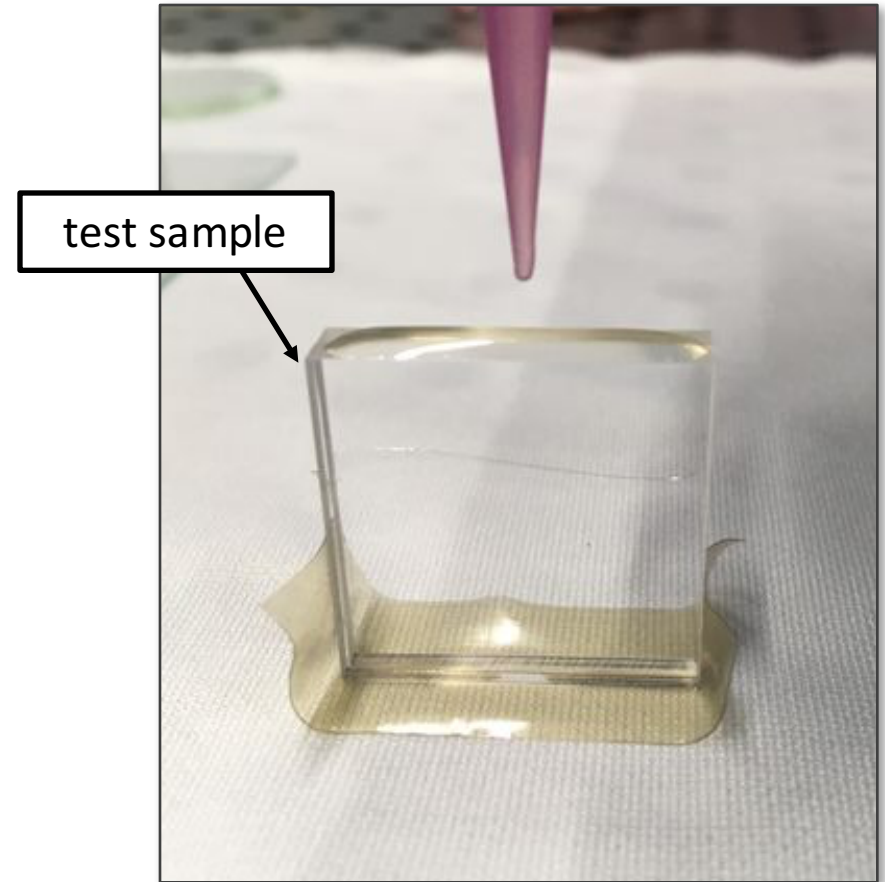
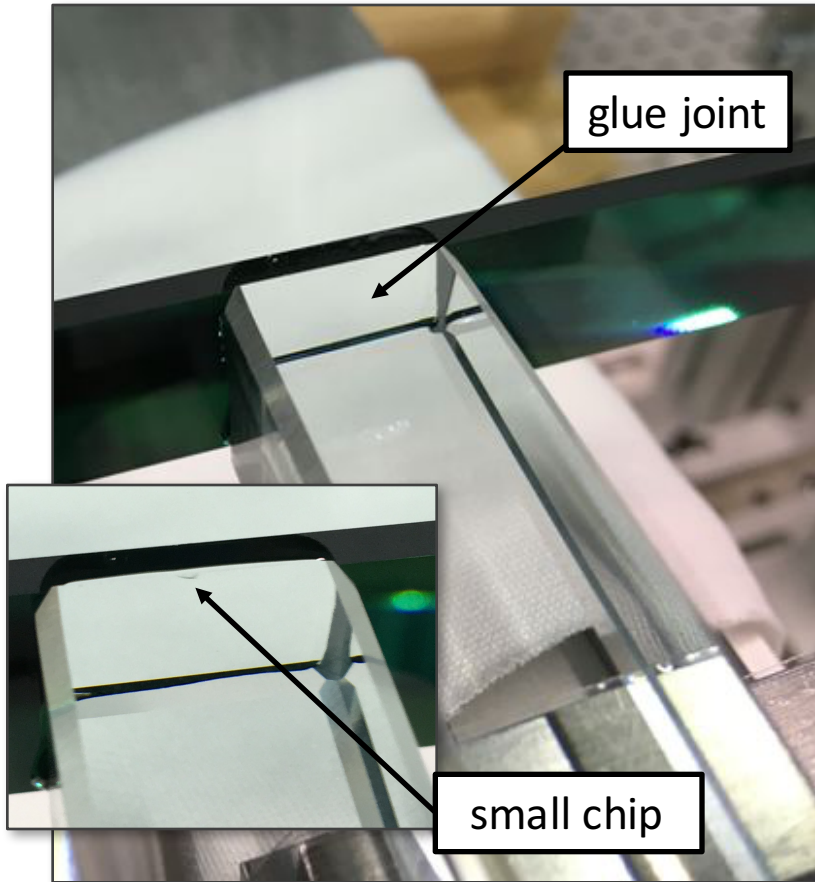
- Little stress led to a break of both glue joints
- Glue joints were removed and inspected

Gluing with Epotek 301-2 (preparation of glue)



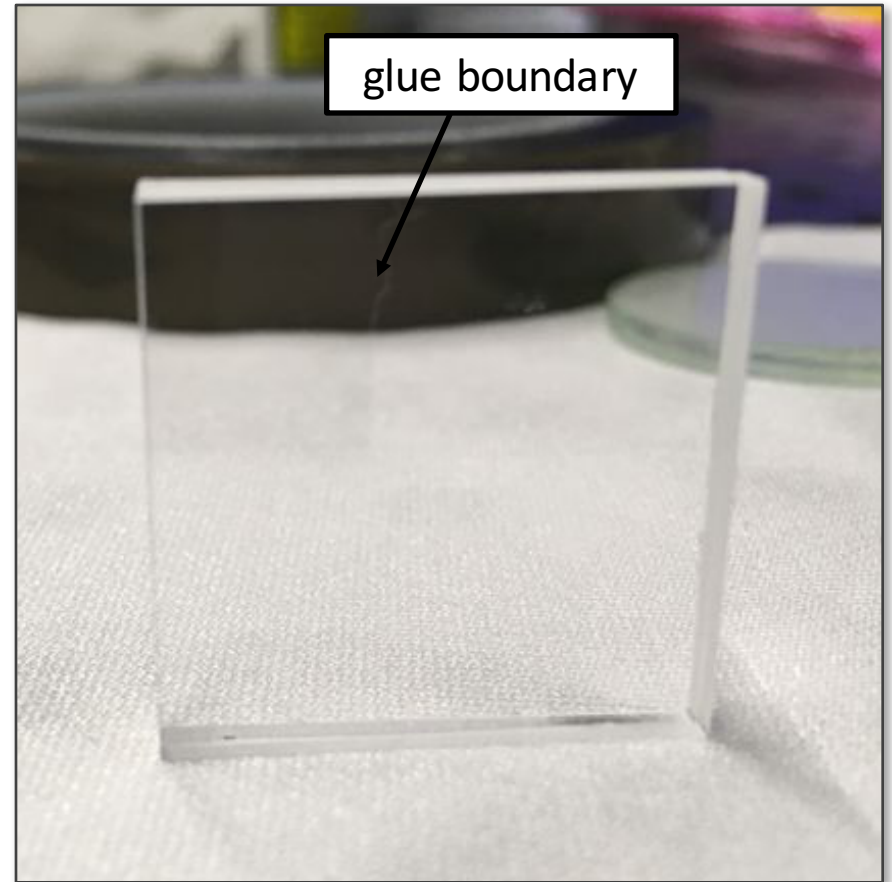
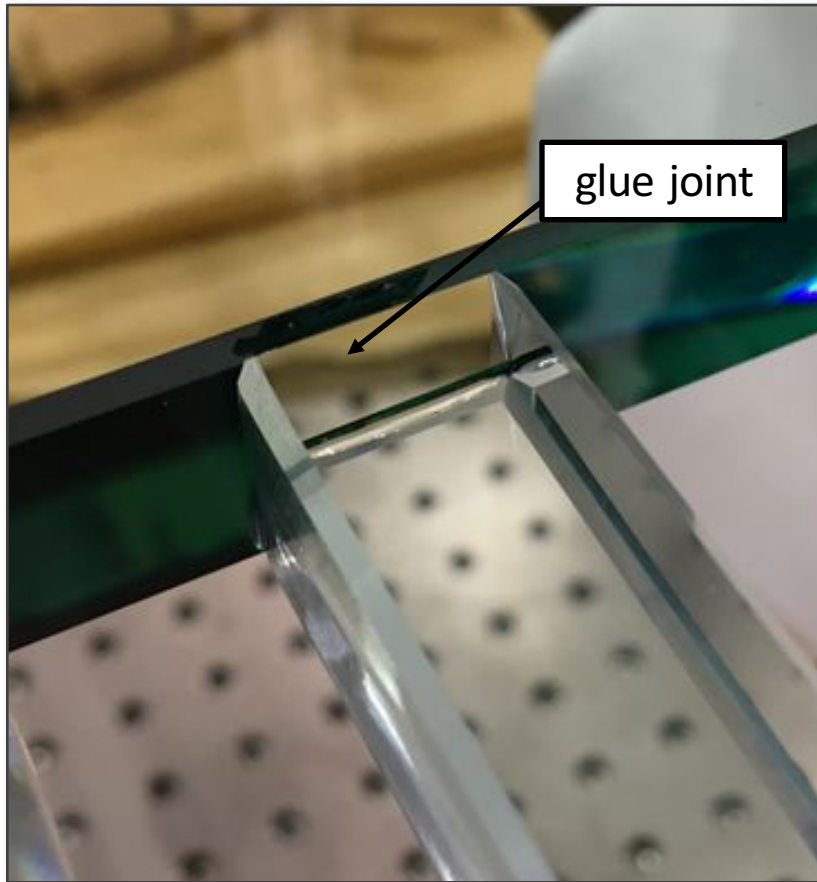
- components mixed by hand
- bubbles removed inside vacuum

Gluing with Epotek 301-2 (application and result)



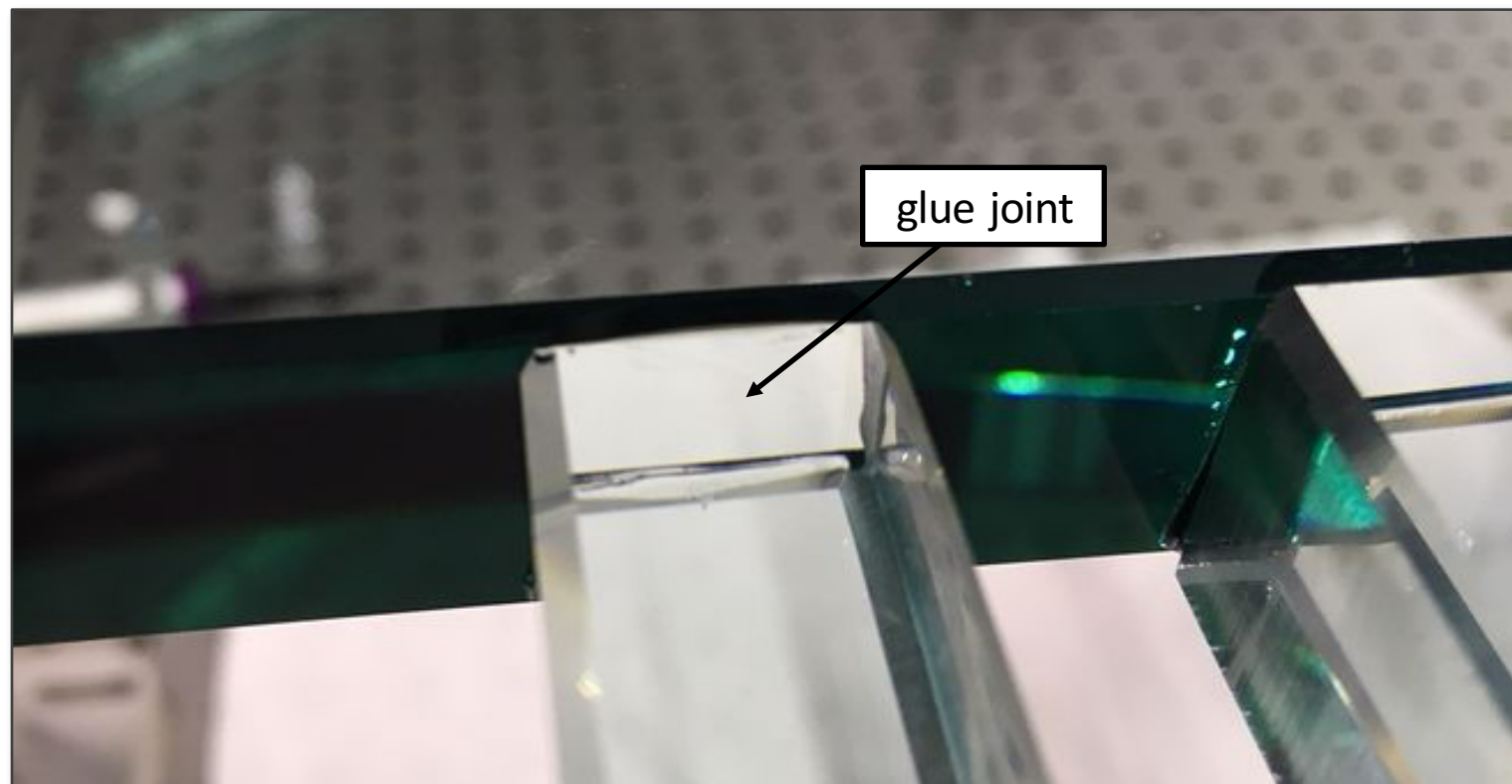
- gluing went well, not bubbles or inclusions could be detected
- small chip vanished as glue filled it out

Gluing with APM Epicol (application and result)



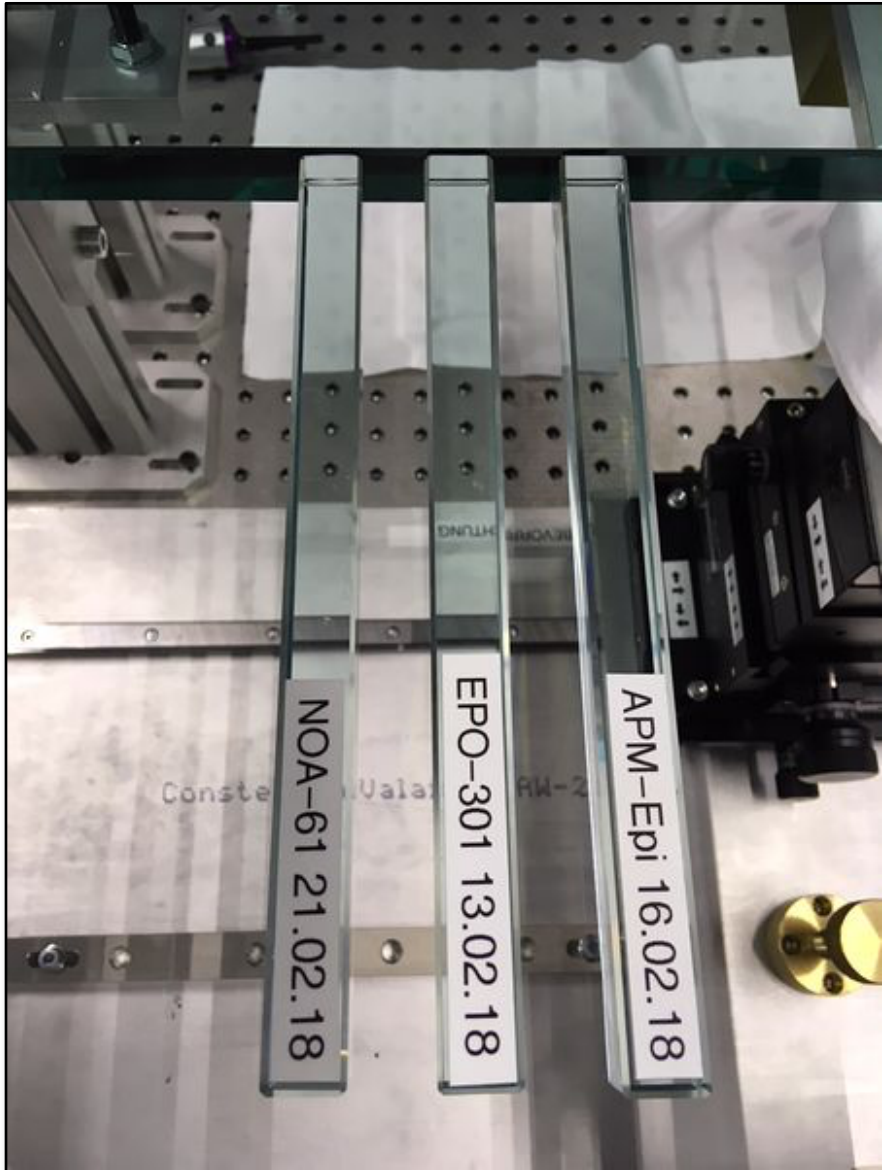
- gluing went well, however:
- capillary forces did not fill full test sample, glue residuals appear bluish
- residuals cured slower than expected (wrong mixture -> precision scale ordered)

Gluing with NOA-61 (3rd try)



- NOA-61 was gassed out in vacuum
- illumination with UV light was done in several steps from various positions
- glue joint does not show any inclusions or defects even after several days

Overview



- solid glue joints were produced with each of the available adhesives
- setup works well and allows good handling of the optics
- available tools can be recommended
- outgassing of glue went well
- UV curing involves the risk of defects if curing is not done homogeneously

Outlook

- static load tests with available glue joints
- develop setup to precisely align bars to radiator (so far just by visual judgement)
- repeat glue tests (use precision scale for mixing)

- evaluate transmission samples inside spectrometer
- test samples for radiation hardness