

# Barrel DIRC – Bar Box Prototype

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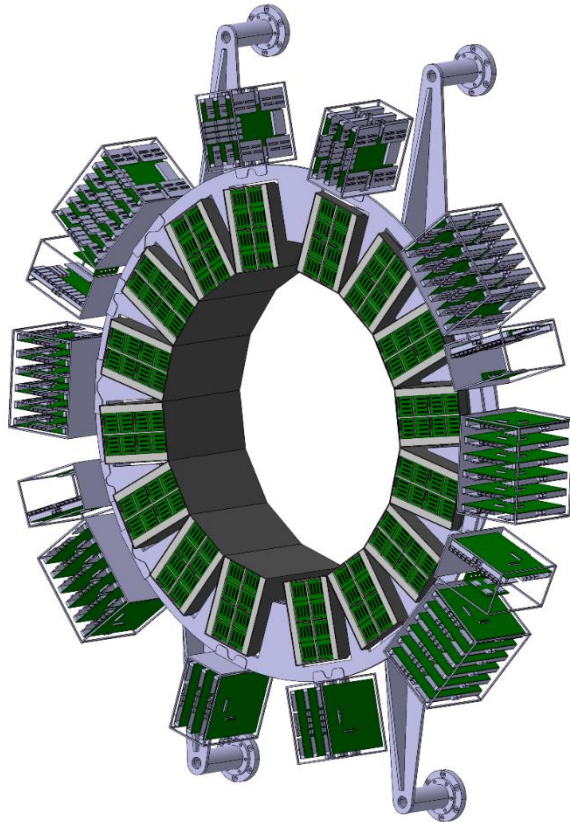
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- Barrel DIRC main components
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# Barrel DIRC main components

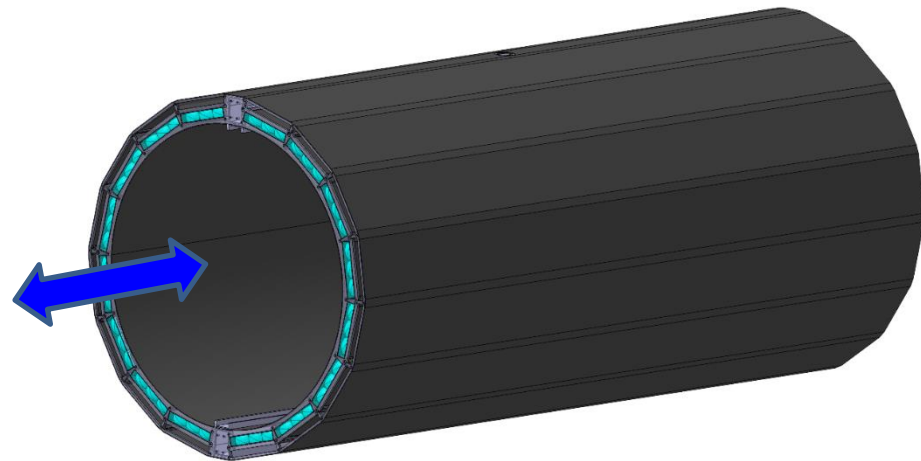
## Readout Unit

- Internal radius 448mm
- External radius 1080mm
- Total weight  $\approx$  500kg



## Radiator Barrel (SciTil Support)

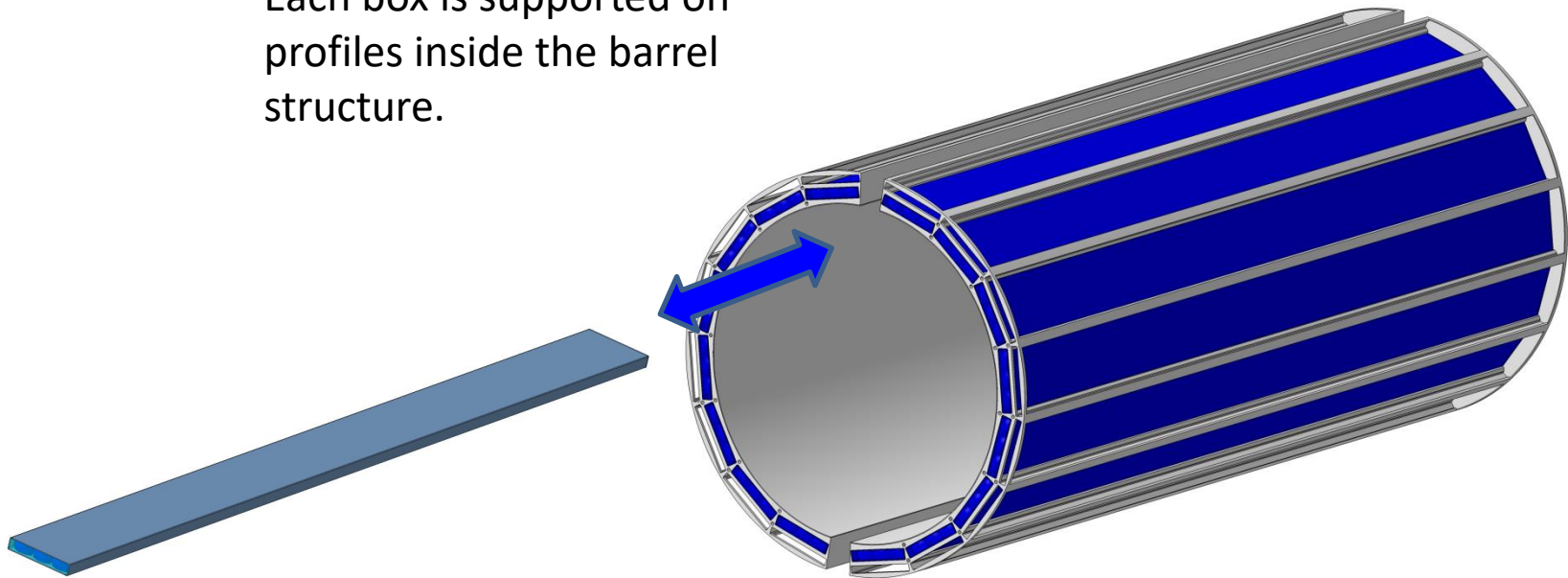
- Internal radius 448mm
- External radius 538mm
- Total weight  $\approx$  400kg



# Barrel DIRC main components

16 bar boxes including:

- Radiator bars.
- Spring-loaded mirrors.
- Block of lenses.
- Total weight of one box  $\approx 20\text{kg}$
- Each box is supported on profiles inside the barrel structure.

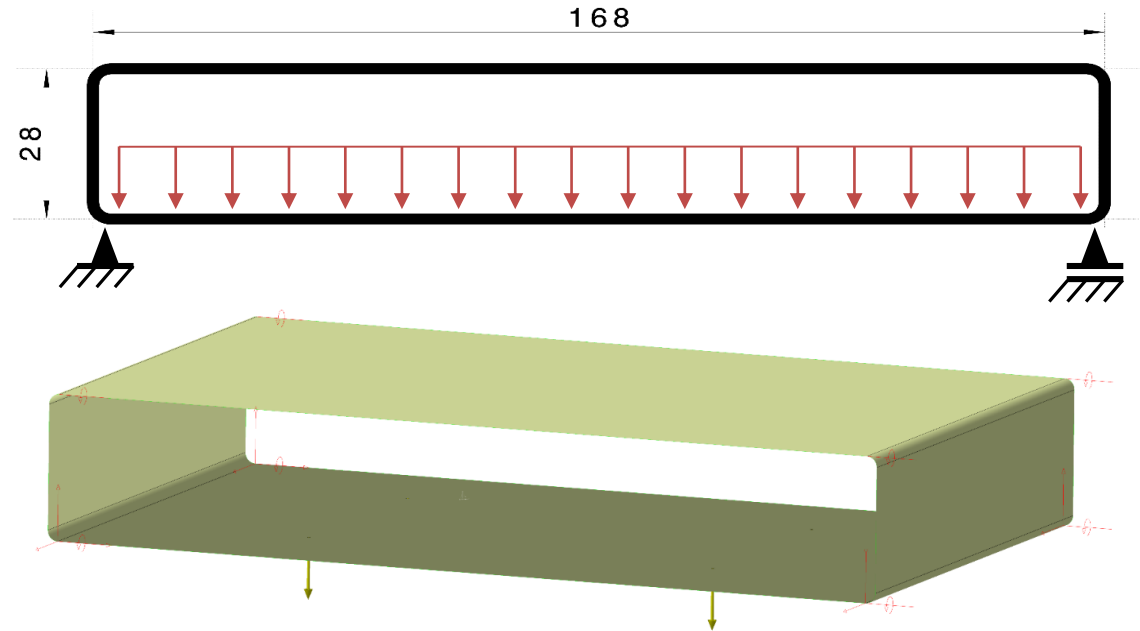


# Requirements of the bar box prototype

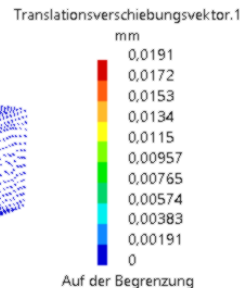
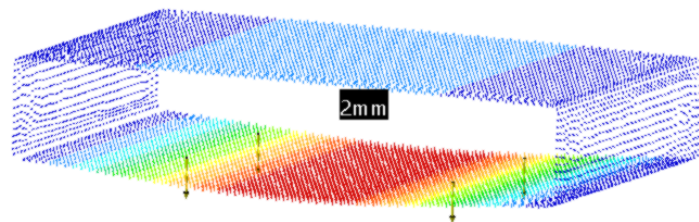
## Wall thickness

Model calculation:

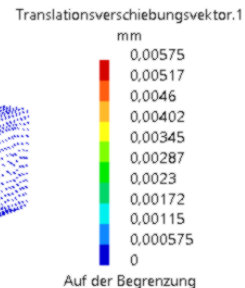
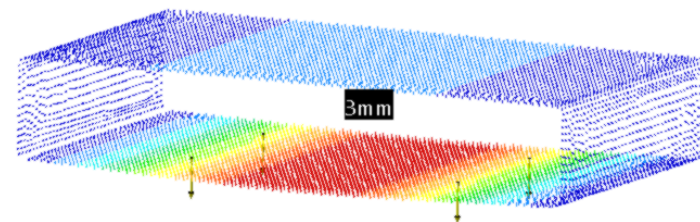
- CFRP as „quasi-isotropic laminate“
- Young's modulus 70000 MPA
- Poisson's ratio 0,35
- Density 1500 kg/m<sup>3</sup>
- Box section length 100mm
- Load in horizontal position and section length of 100mm: 0,6kg
- Distributed load on bottom surface



wall thickness: 2mm



wall thickness: 3mm



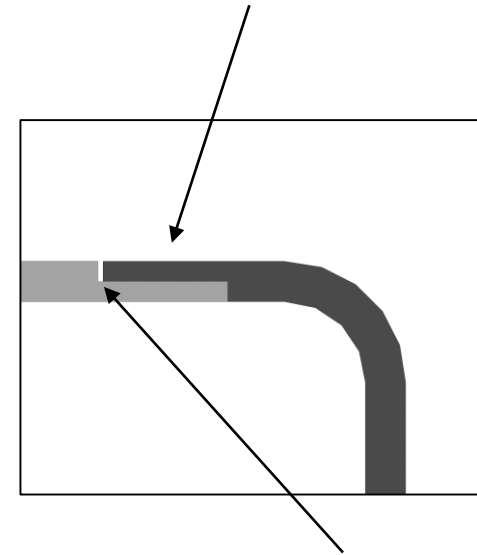
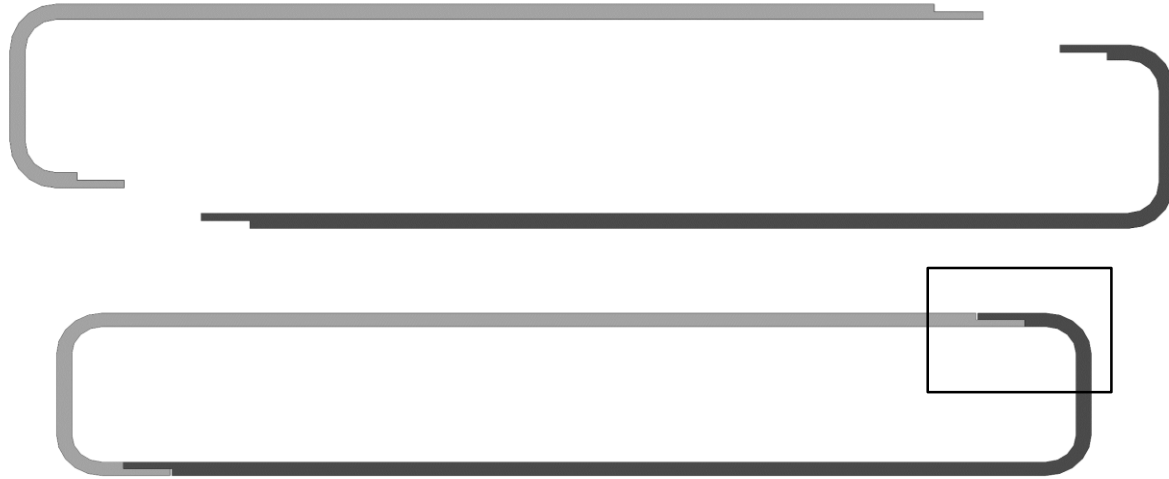
With a wall thickness between 2-3mm, the stiffness should allow a maximum elastic deformation of  $\leq 0,01\text{mm}$ .

# Requirements of the bar box prototype

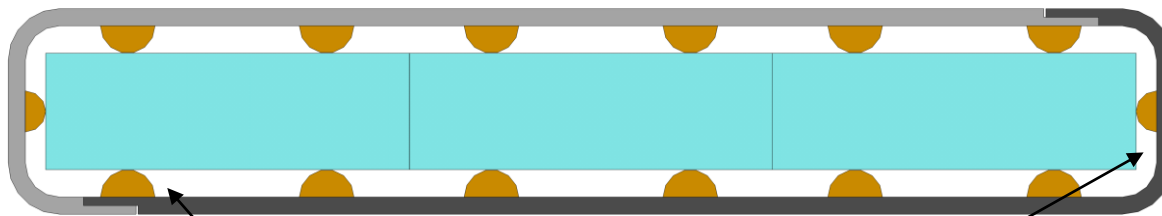
One box consists of two identical „L-elements“:

- Good access during assembly.
- Simplified production process.

Overlap enables possibilities of different connection types (form fit, adhesive joint, inlet screw connection)



Defined gap to ensure a high fitting accuracy.

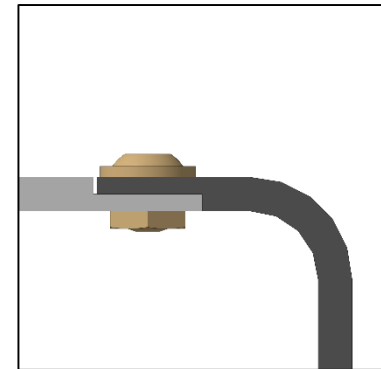
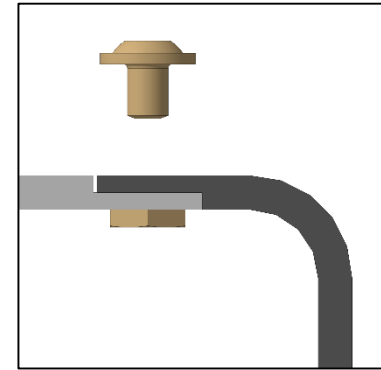
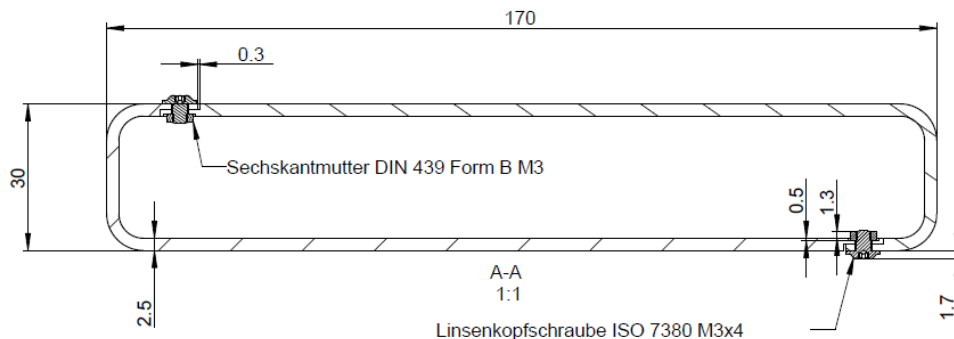
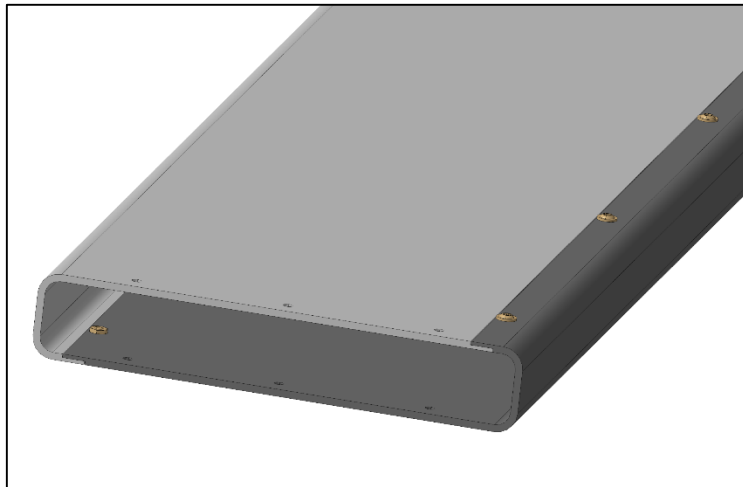


Sufficient space for buttons to support the radiator bars.

# Requirements of the bar box prototype

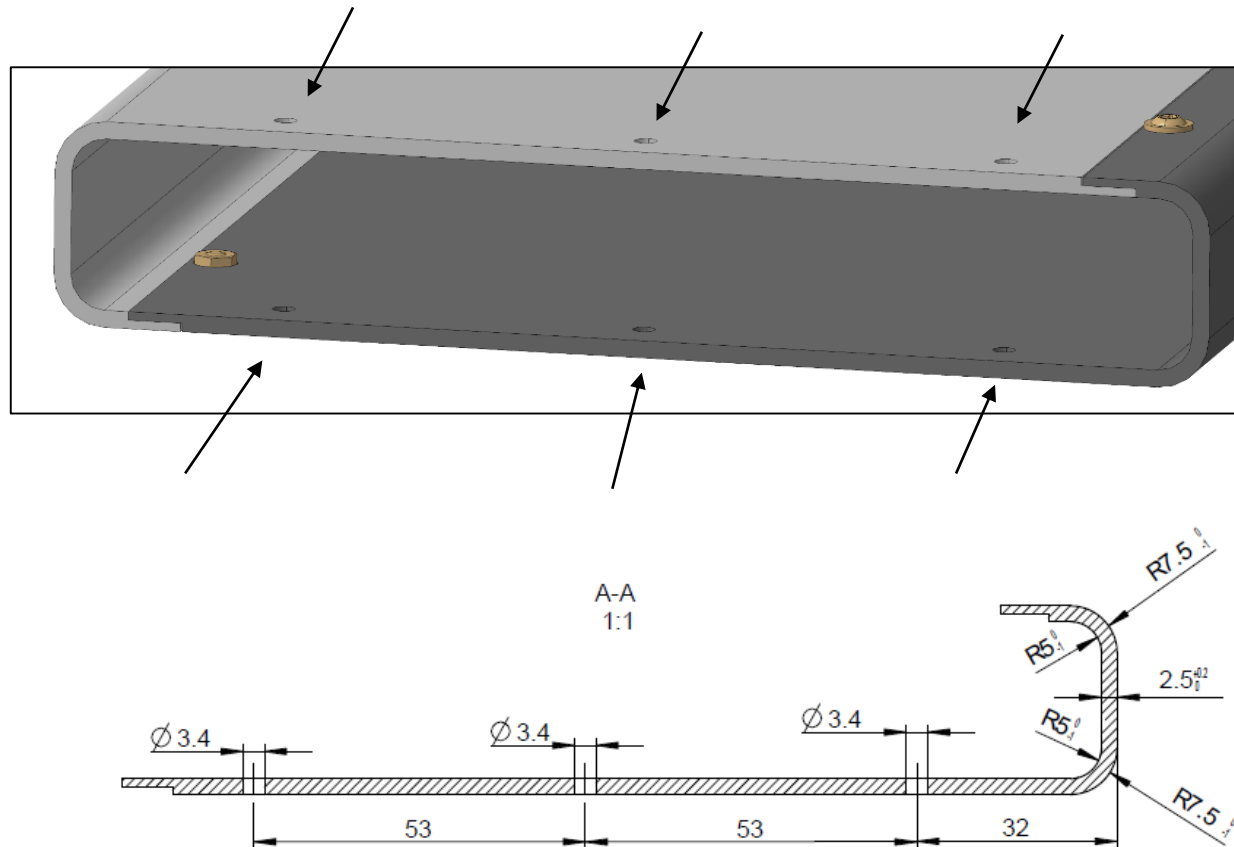
Chosen connection for prototype:

- M3 screws and integrated nuts (glued inside).
- Not suitable for final design, but allows an easy opening and closing of the prototype box.
- Holes for screws and steps for nuts are CNC-machined.



# Requirements of the bar box prototype

Forward and backward mounting holes foreseen to implement and test different endcaps (mirror module and lens module).







# Mechanical design of the bar box prototype

L-element production (version 1):

Outer surface

Inner surface: Poorly soaked areas result in surface defects.



image source: KVB GmbH

# Mechanical design of the bar box prototype

L-element production (version 2):

Adaptions in vacuum procedure and usage of special „tear-off“ fleece leads to reduction of surface defects.

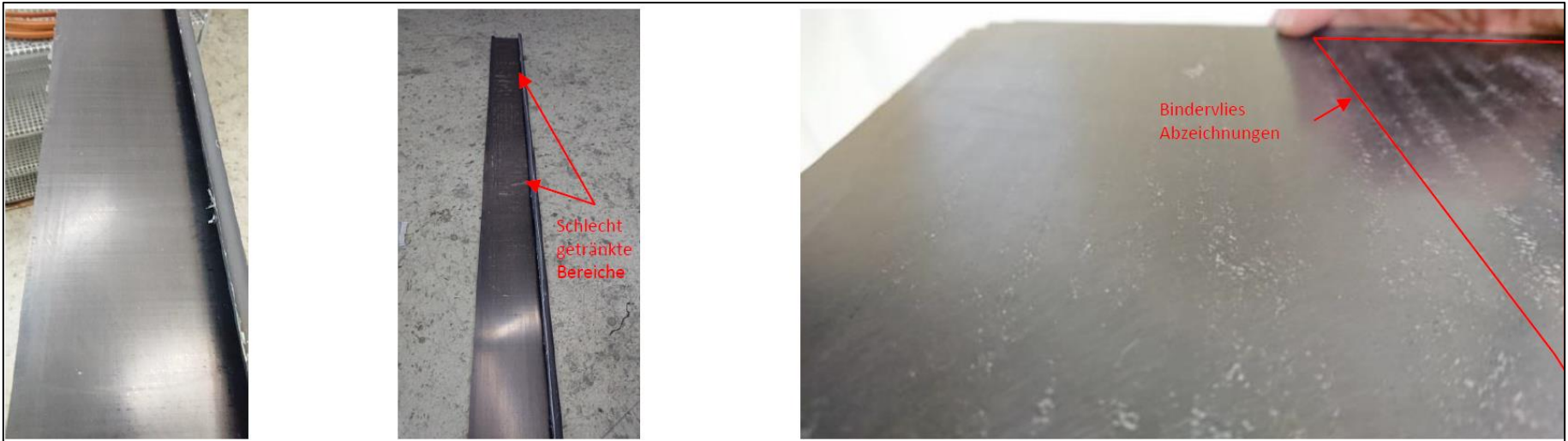
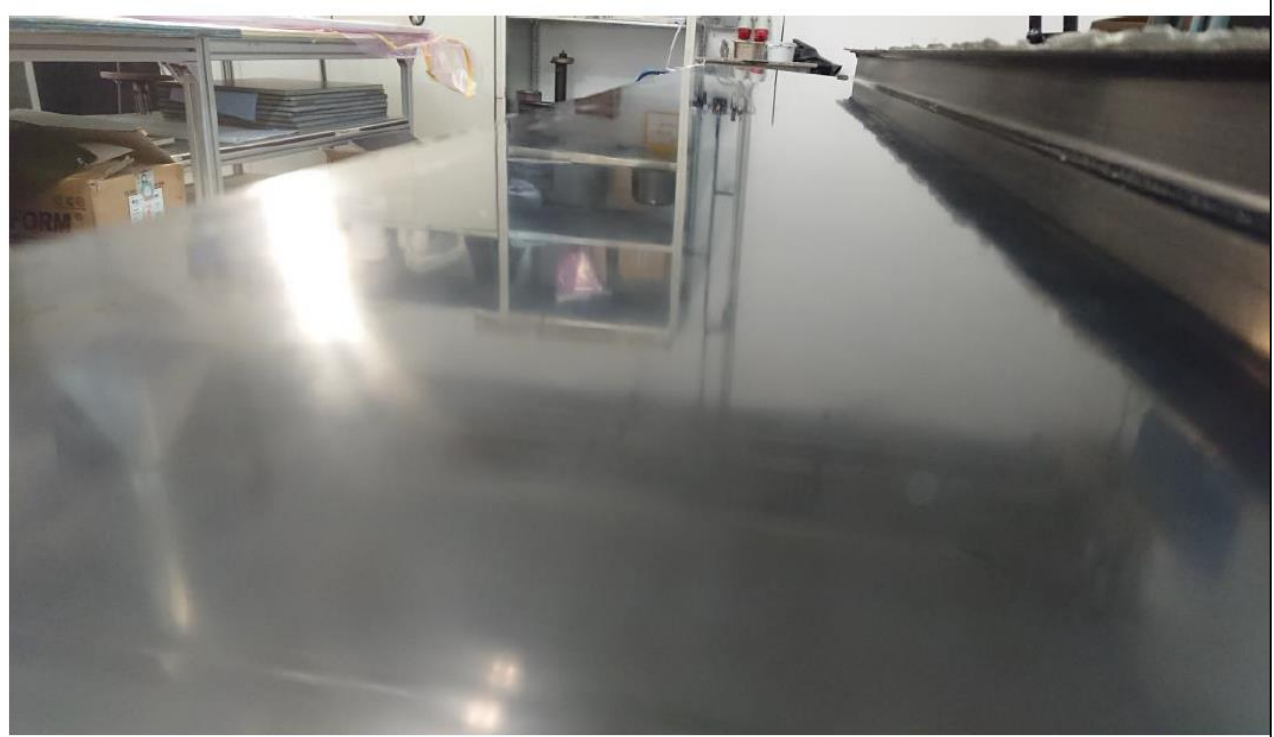


image source: KVB GmbH

# Mechanical design of the bar box prototype

L-element production (version 3):

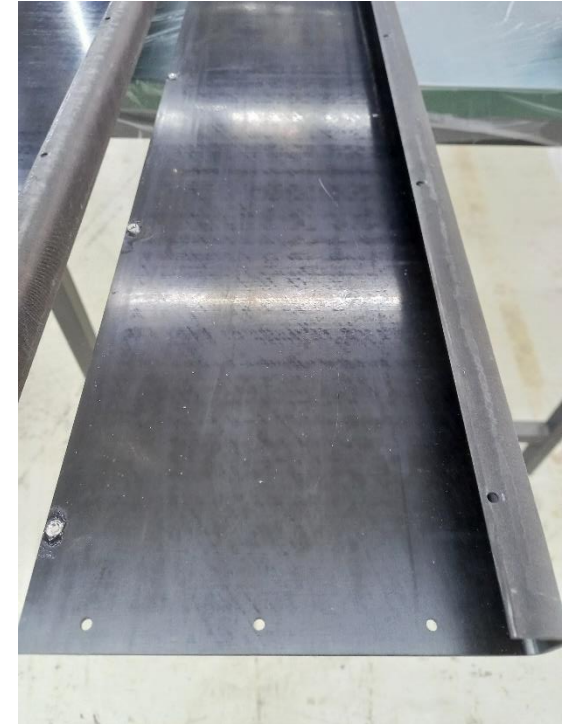
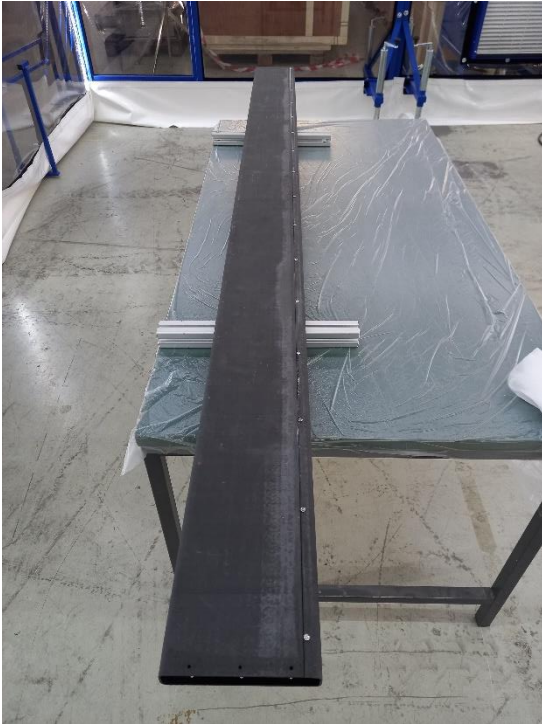
Further adaptations and additional usage of binder powder between fleece and surface lead to acceptable result.



*image source: KVB GmbH*

# Mechanical design of the bar box prototype

Bar box arrival in our lab (April 2022):





# Essential goals for prototype testing

- Design and integration of buttons (bar support).
- Test of the stability of the box filled with “dummy” bars.
- Handling of the fully equipped box.
- Design of endcap modules (mirrors and lenses).
- Implementation of nitrogen purging.
- ...

Thank you for your attention.