

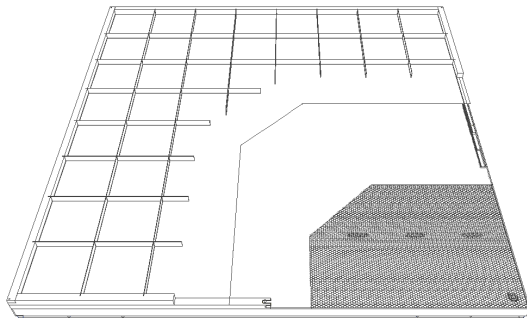
Chamber construction & production

CBM-TRD TDR Review

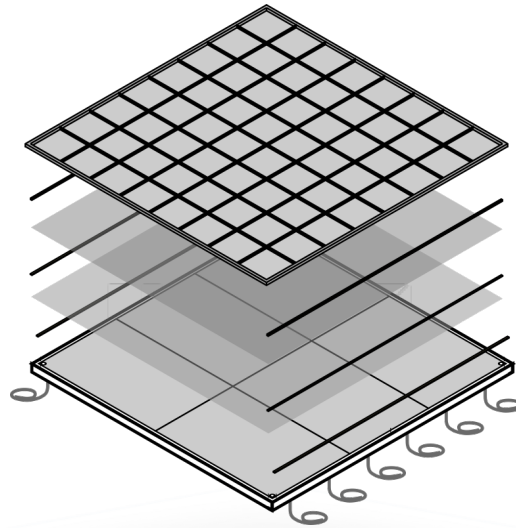
FLORIAN ROETHER – INSTITUT FÜR KERNPHYSIK FRANKFURT



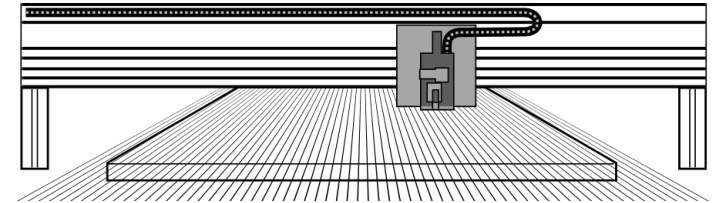
AGENDA



Chamber Design



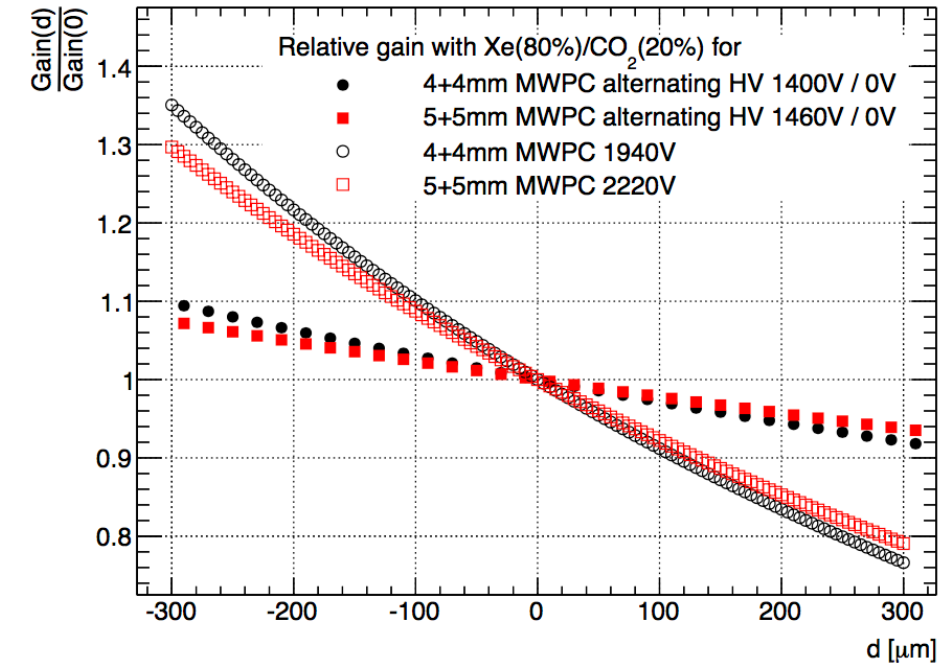
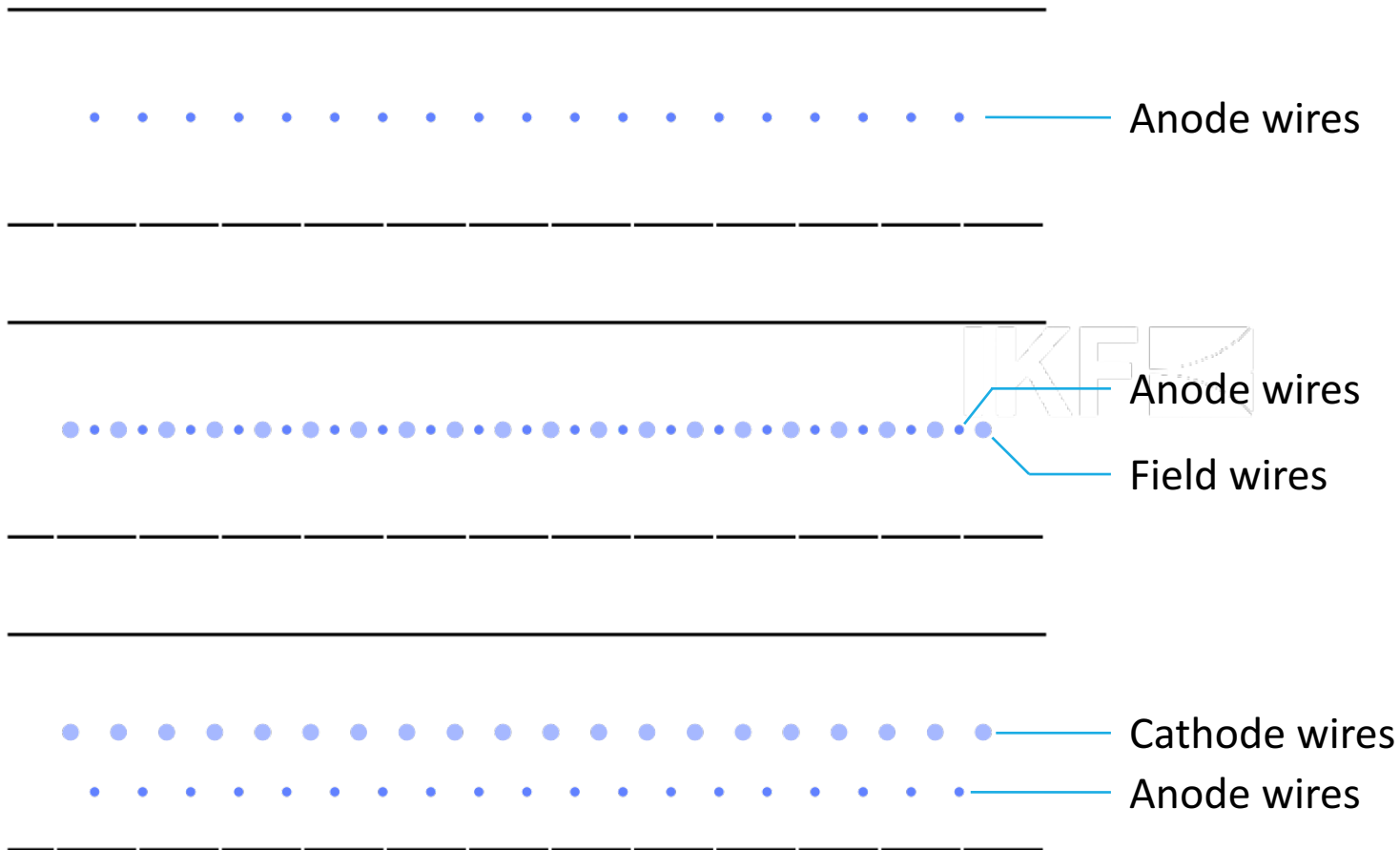
Chamber Construction



Machinery & Facilities

CHAMBER DESIGN

WIRE GEOMETRY



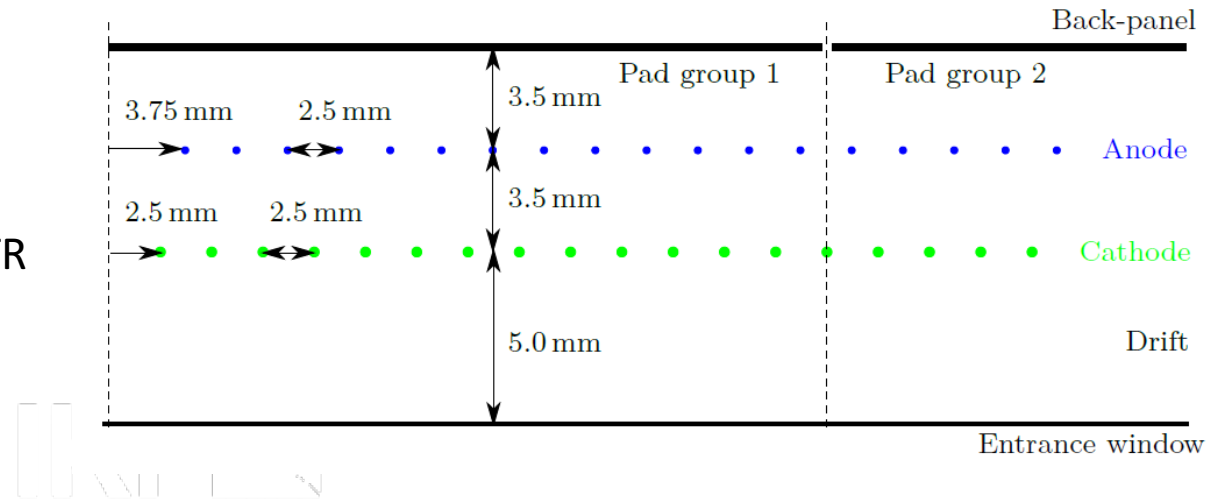
CHAMBER DESIGN

WIRE GEOMETRY

Amplification region: 3.5+3.5mm

Drift region: 5mm

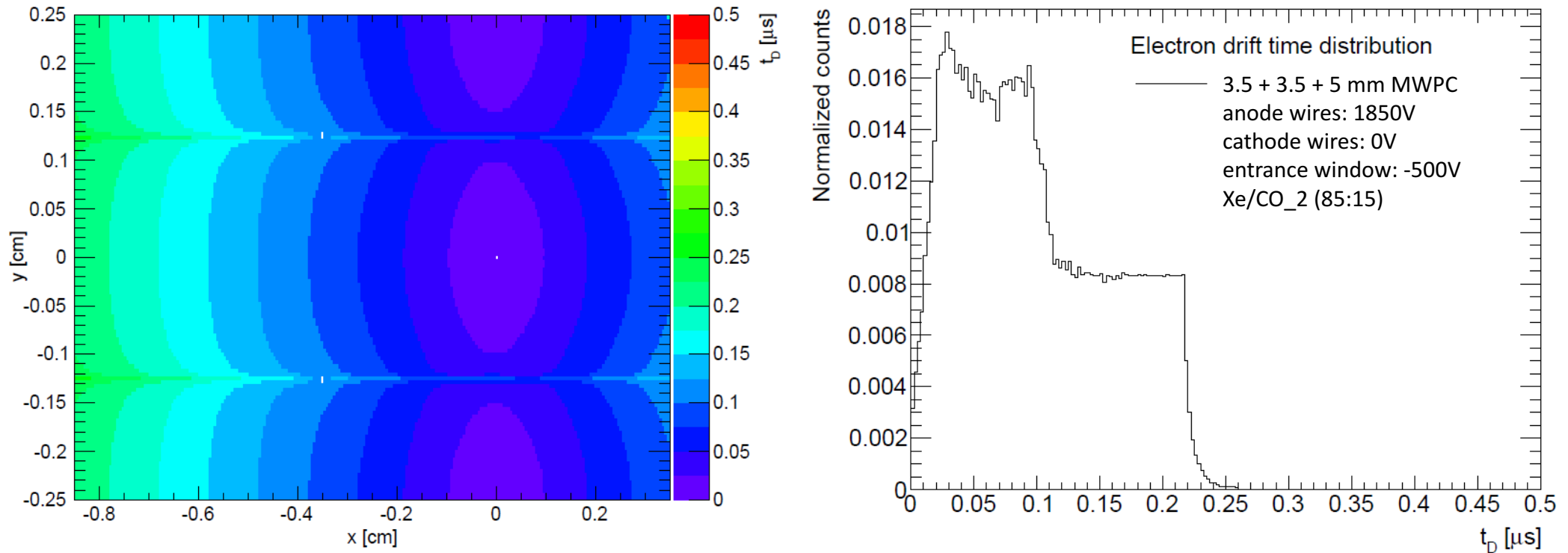
The additional drift region ensures a high TR absorption probability. A fast, symmetric MWPC has also been tested.



	Anode wires	Cathode wires	Entrance window
Material	Cu-Be	W (Au-plated)	Aluminized Kapton
Diameter/Thickness	75 μm	20 μm	25 μm
Tension	100 cN	50-55 cN	0.15 %
Pitch	2.5 mm	2.5 mm	NA
Nominal voltage	+ 1850 V	0 V	- 500 V

CHAMBER DESIGN

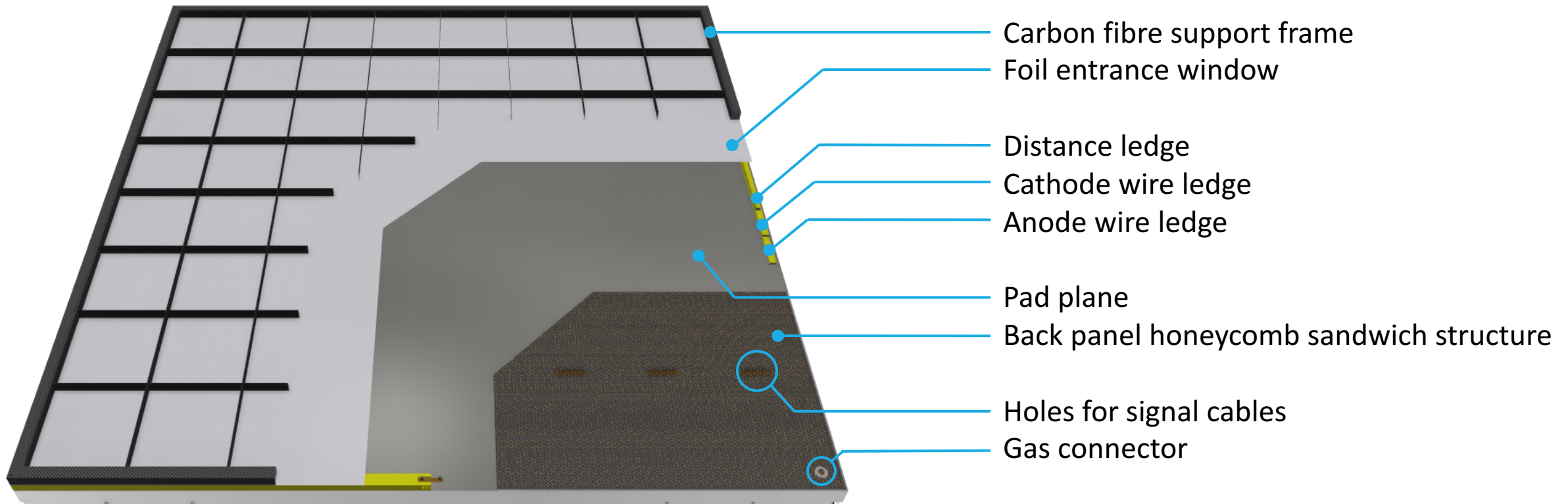
ELECTRON DRIFT TIME DISTRIBUTION



A symmetric 3.5+3.5 mm amplification region has signal collection time of 0.1 μs .
The additional 5 mm drift region (with 100V/mm) adds 0.125 μs to the total electron drift time.
A signal collection time below 0.3 μs is sufficient even at trigger rate of 100kHz (SIS300)

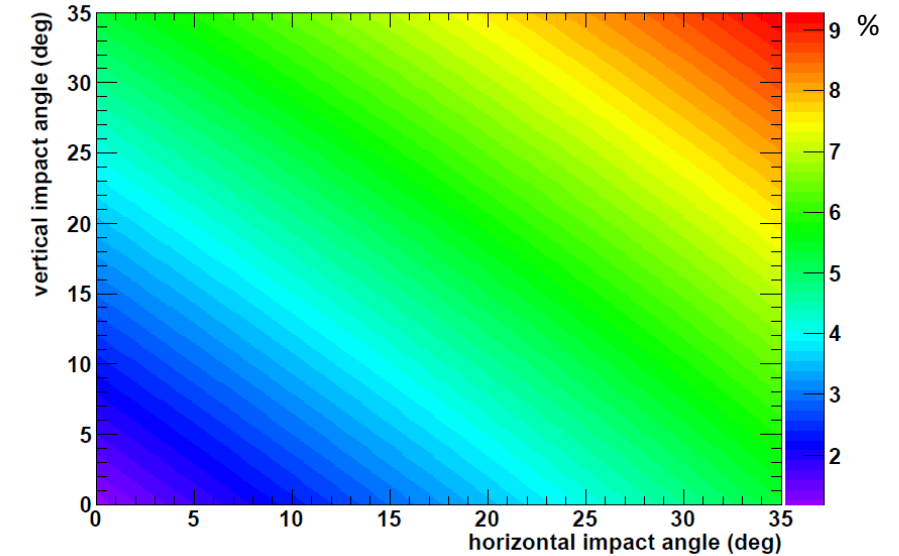
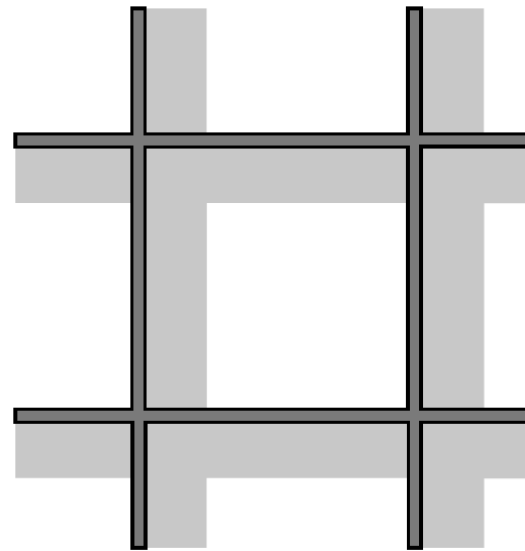
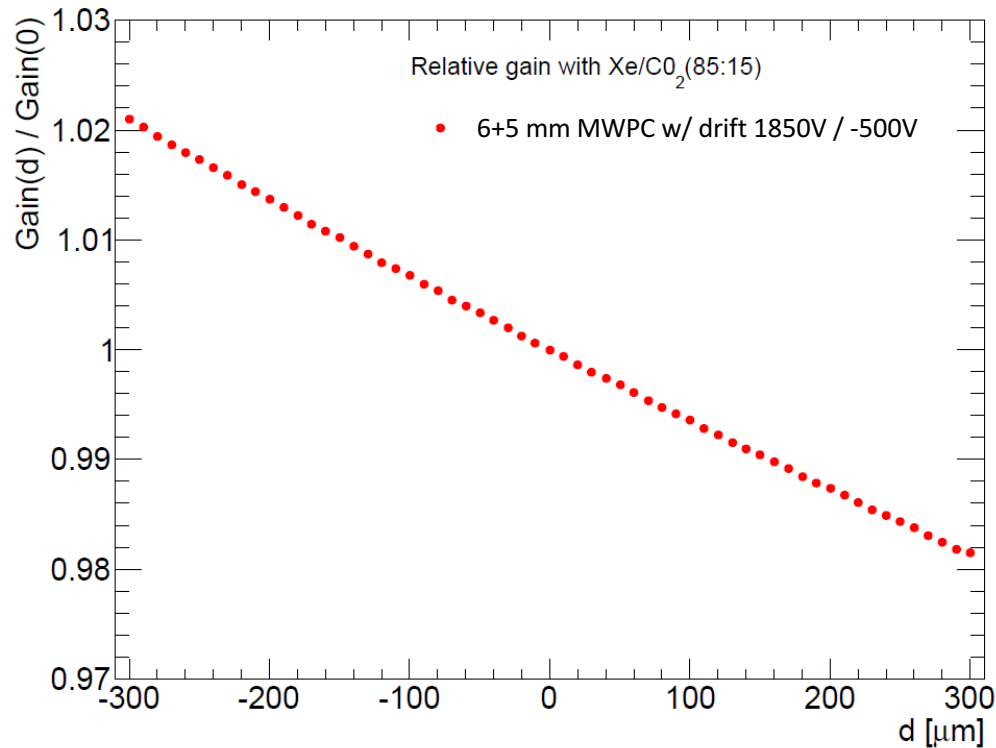
CHAMBER DESIGN

SCHEMATIC VIEW



CHAMBER DESIGN

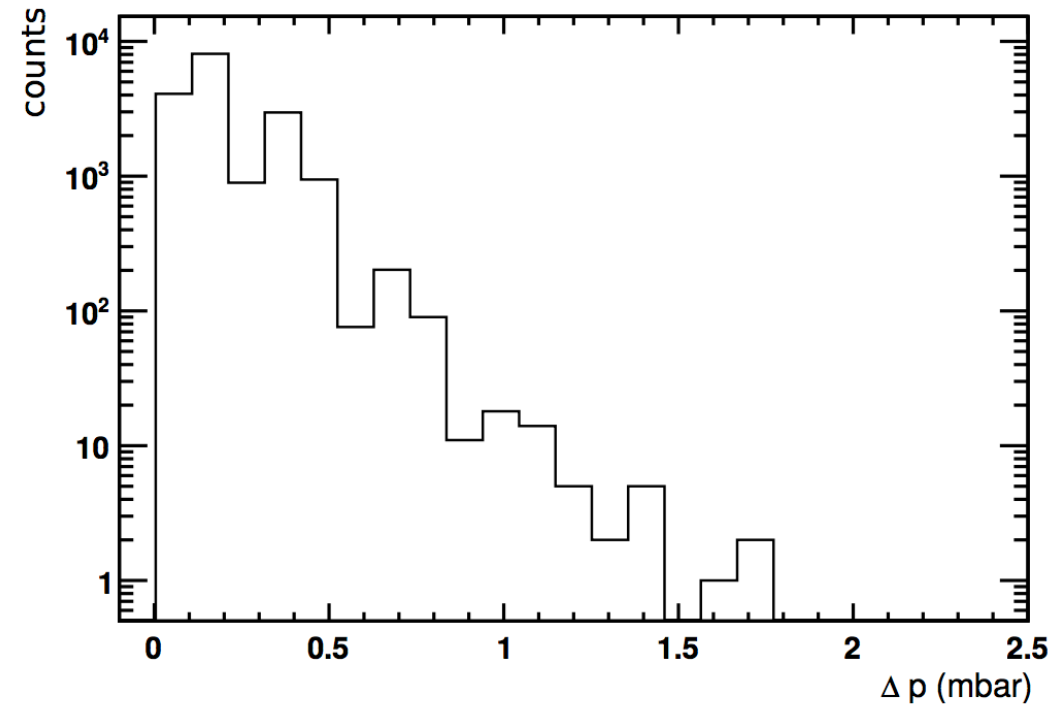
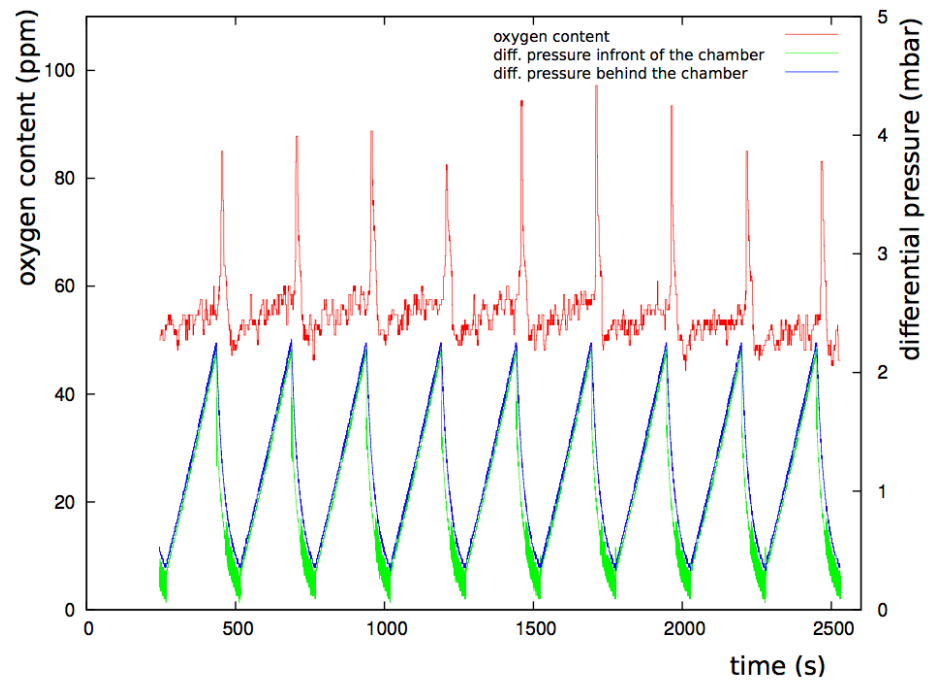
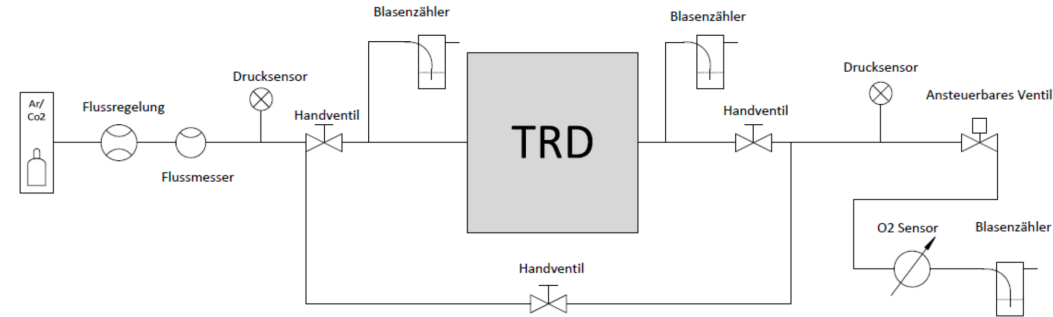
CARBON FIBRE SUPPORT FRAME



The deformation of the entrance window has a direct impact on the gas amplification. To minimize the deformation of the Kapton foil the entrance window is supported by a carbon lattice grid.

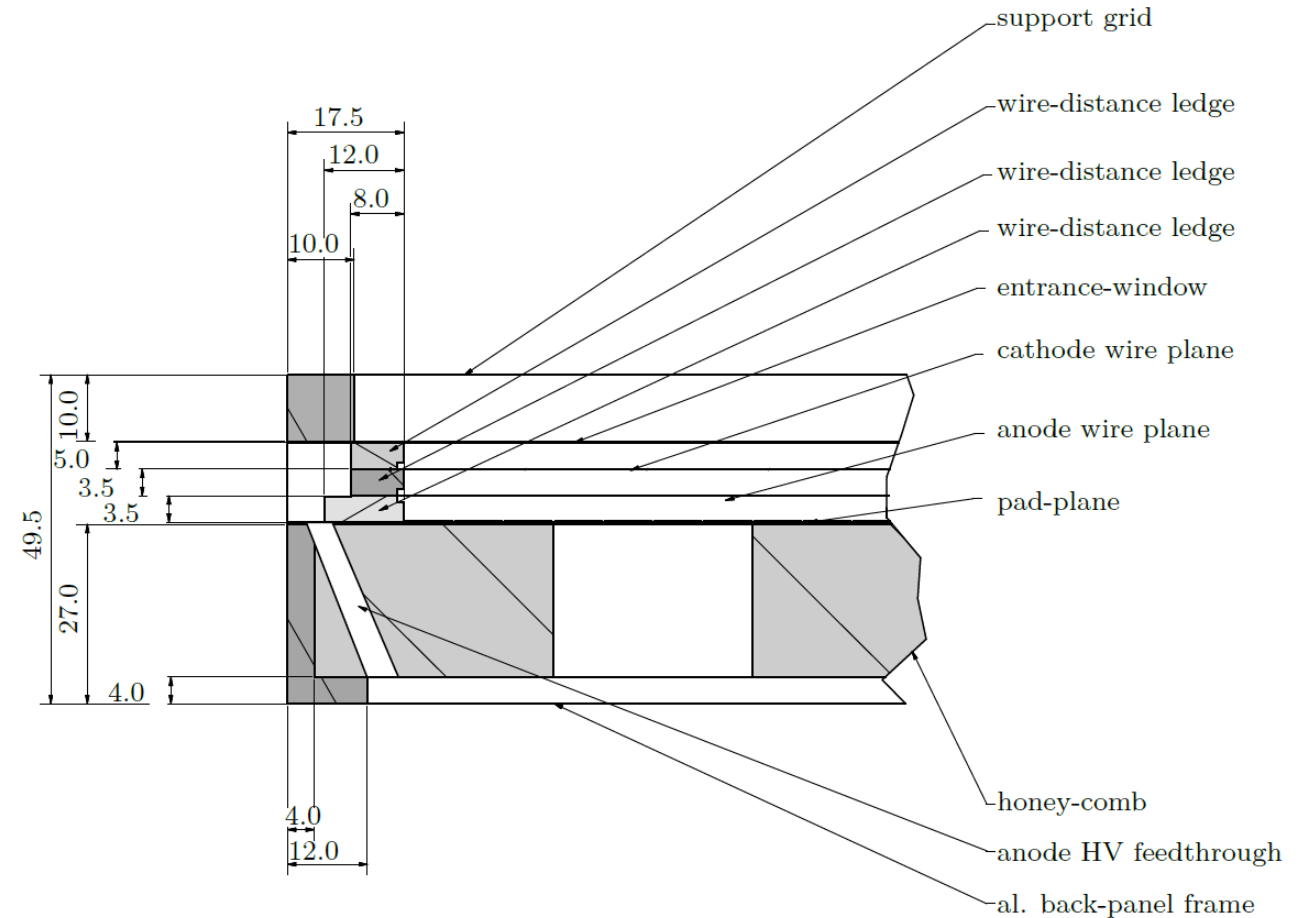
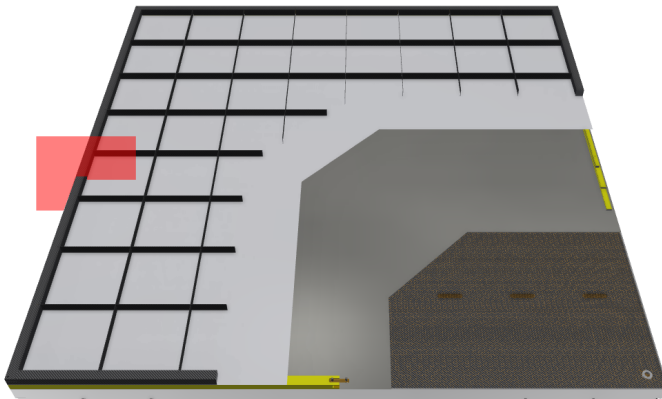
CHAMBER DESIGN

FOIL STRESS TEST



CHAMBER DESIGN

CROSS SECTION



CHAMBER DESIGN

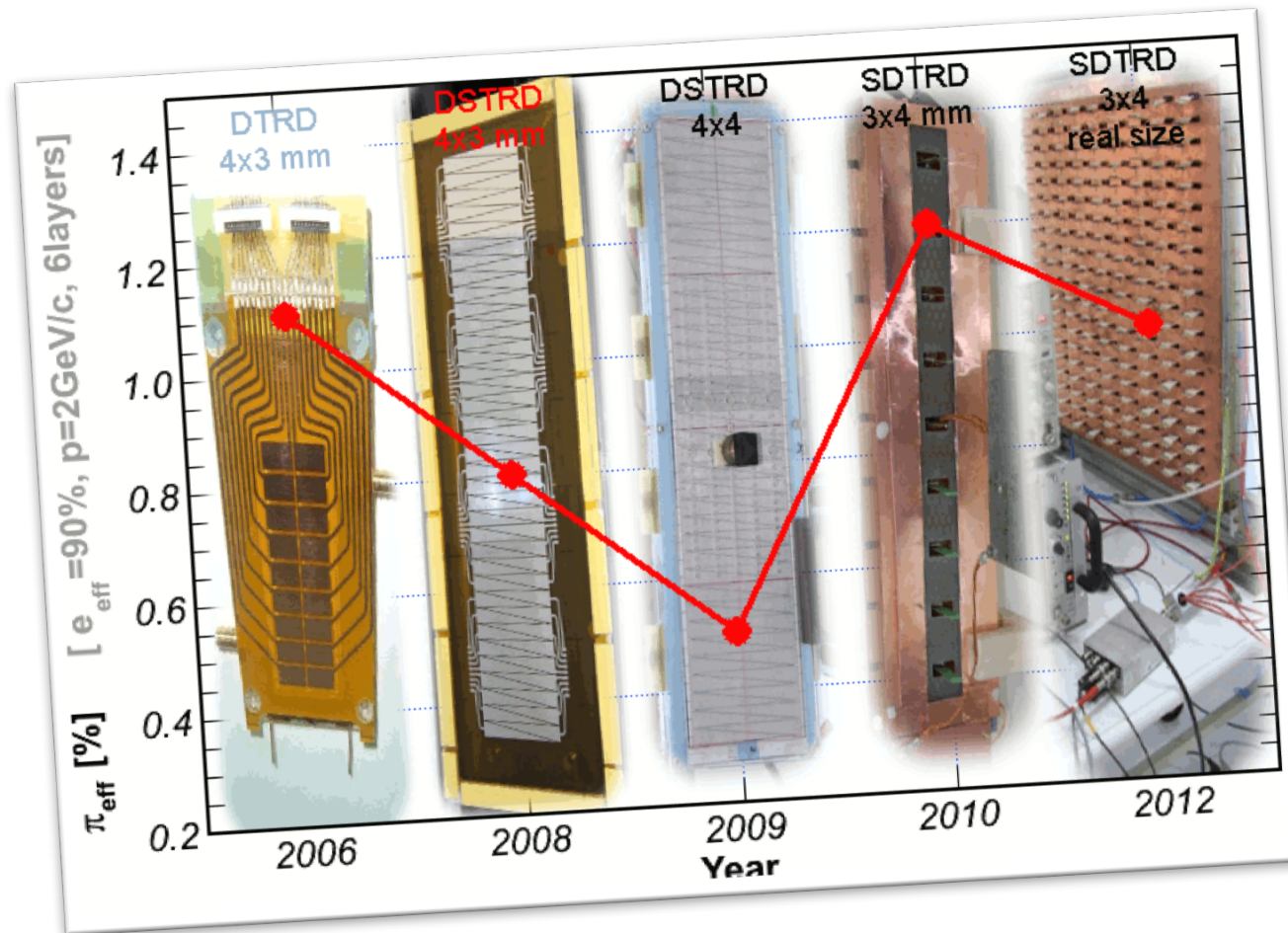
USED METERIALS

Part	Material
Entry window foil	Aluminium, Kapton
Entry window support frame	Vetronite*, Carbon fibre
Ledges	Vetronite*
Contact stripes	Copper, Solder
Anode wires	Tungsten core, gold plated
Cathode wires	Beryllium-Copper
Back panel frame	Aluminium, Brass
Back panel	Paper, Carbon fibre
Glue	AW106, AW116 (epoxide)

*High temperature epoxy glass fabric laminate, G-11 type, class H

CHAMBER CONSTRUCTION

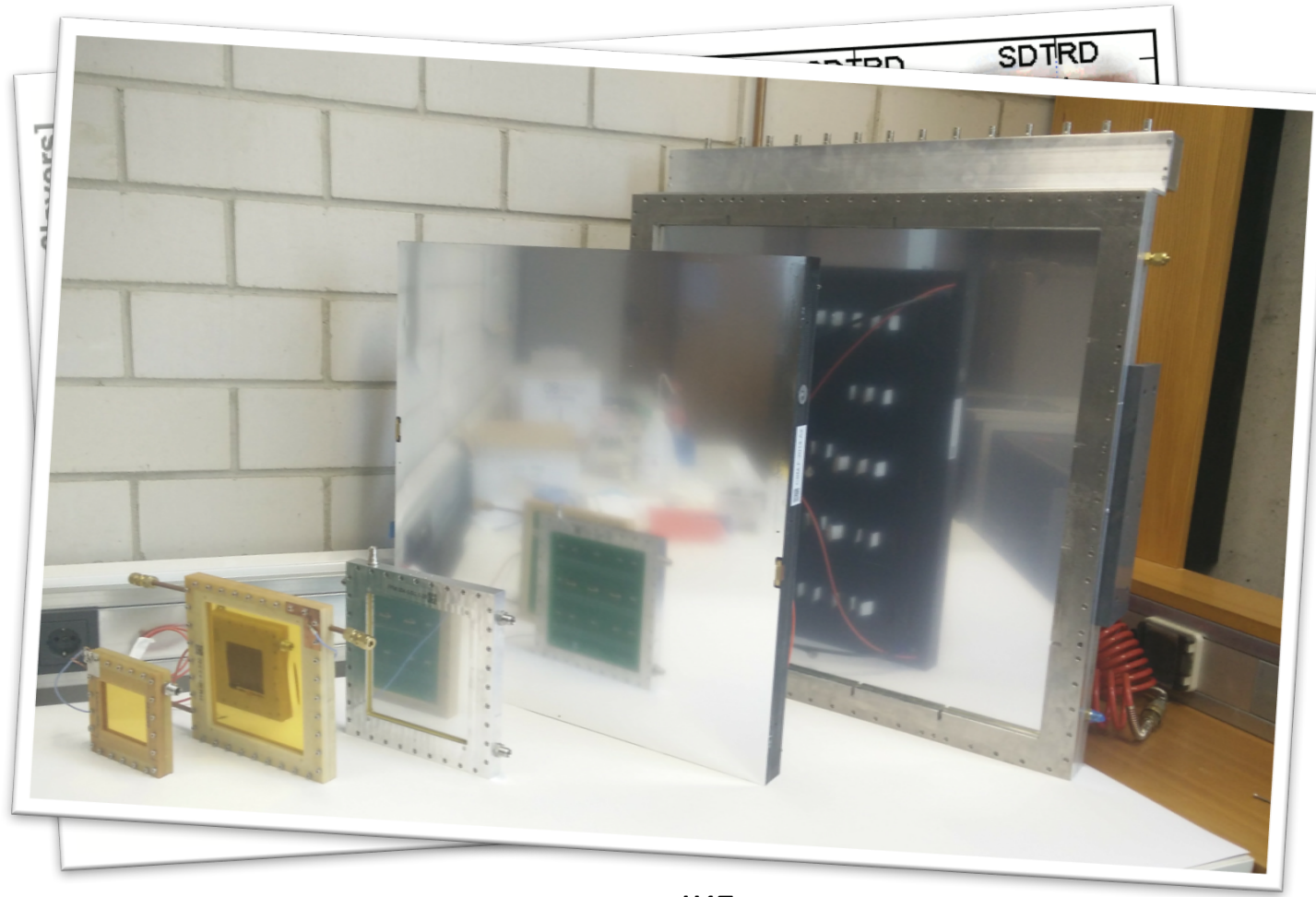
PREVIOUS PROTOTYPES



IFIN-HH

CHAMBER CONSTRUCTION

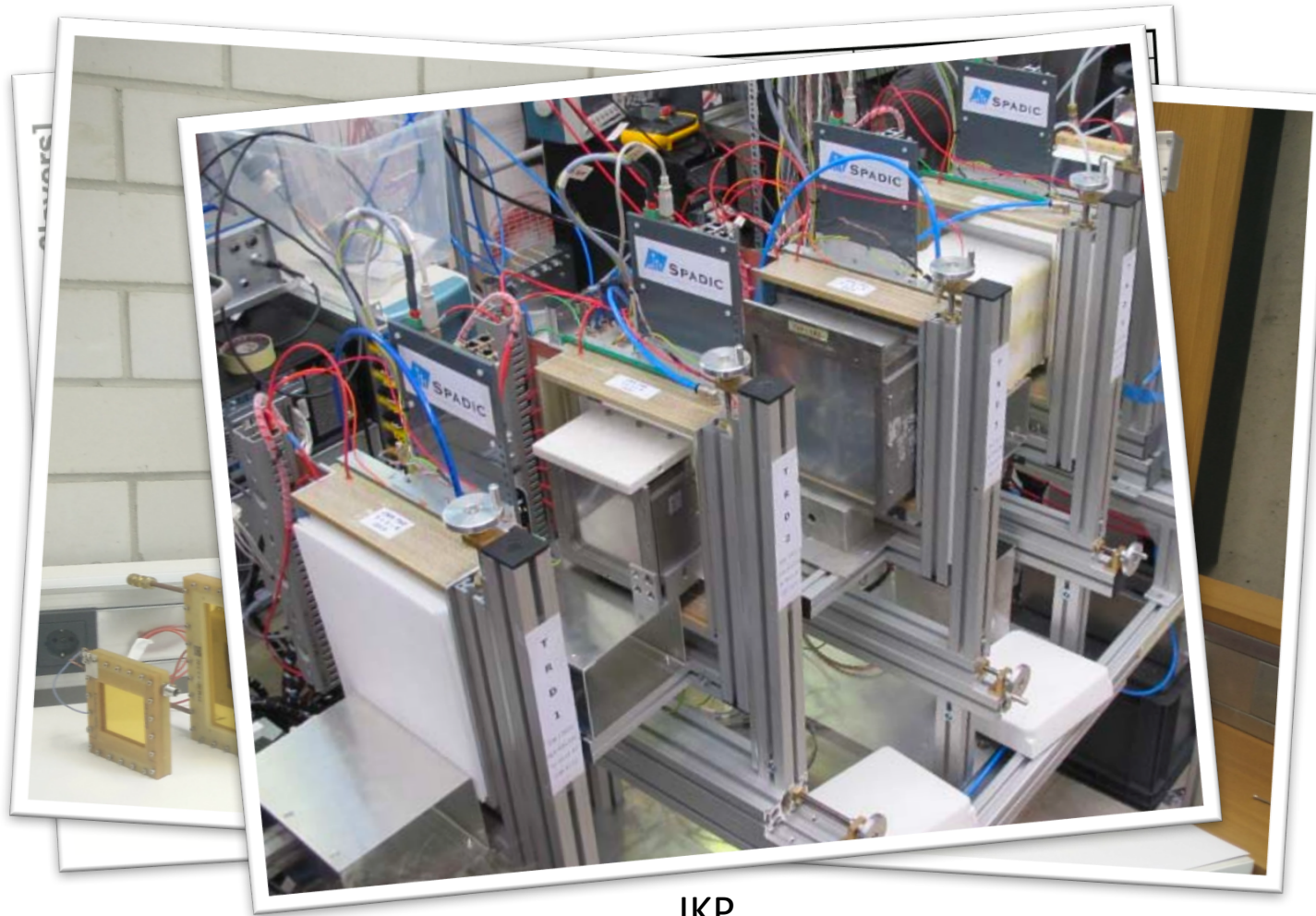
PREVIOUS PROTOTYPES



IKF

CHAMBER CONSTRUCTION

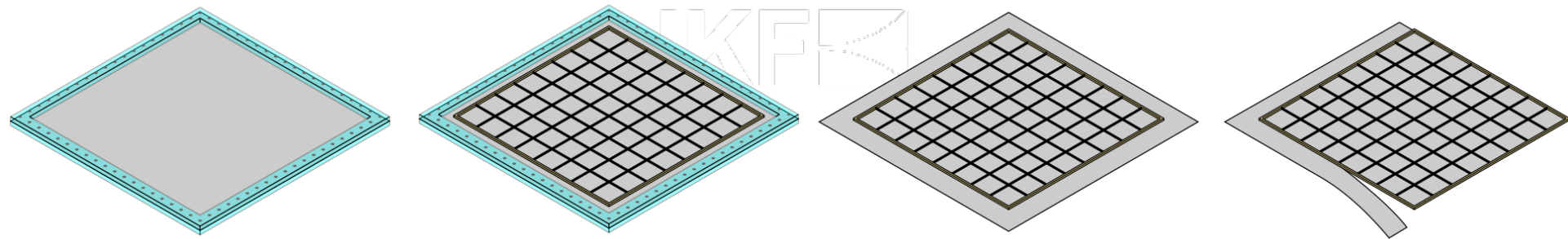
PREVIOUS PROTOTYPES



IKP

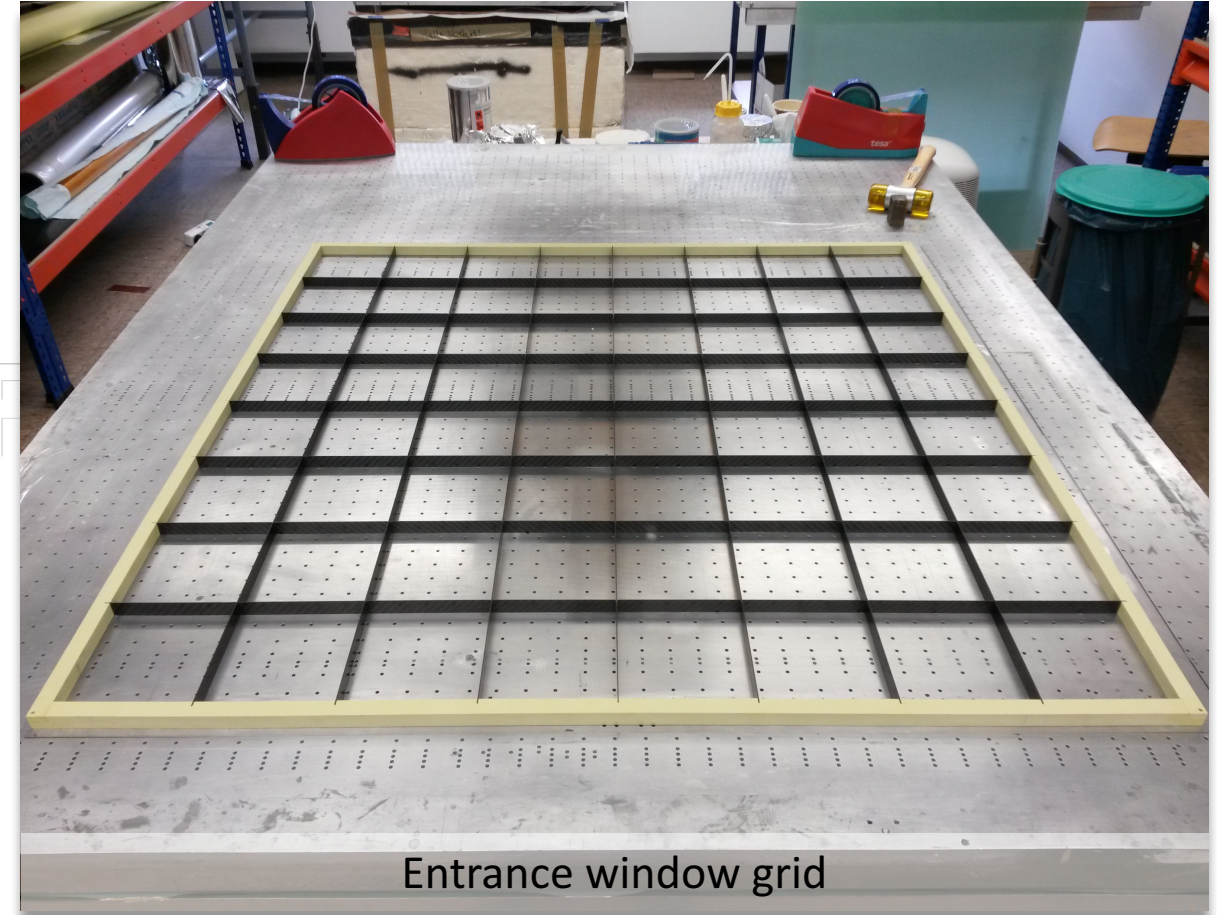
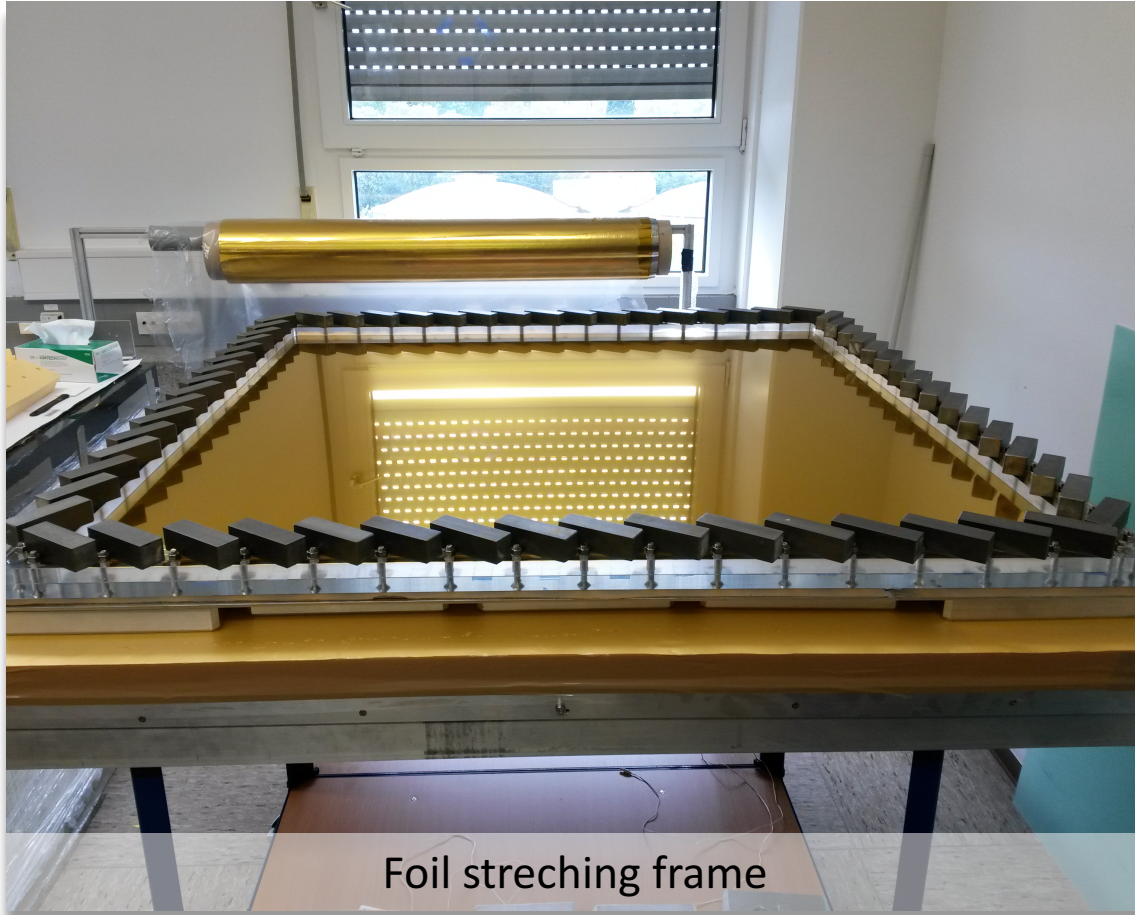
CHAMBER CONSTRUCTION

ENTRANCE WINDOW



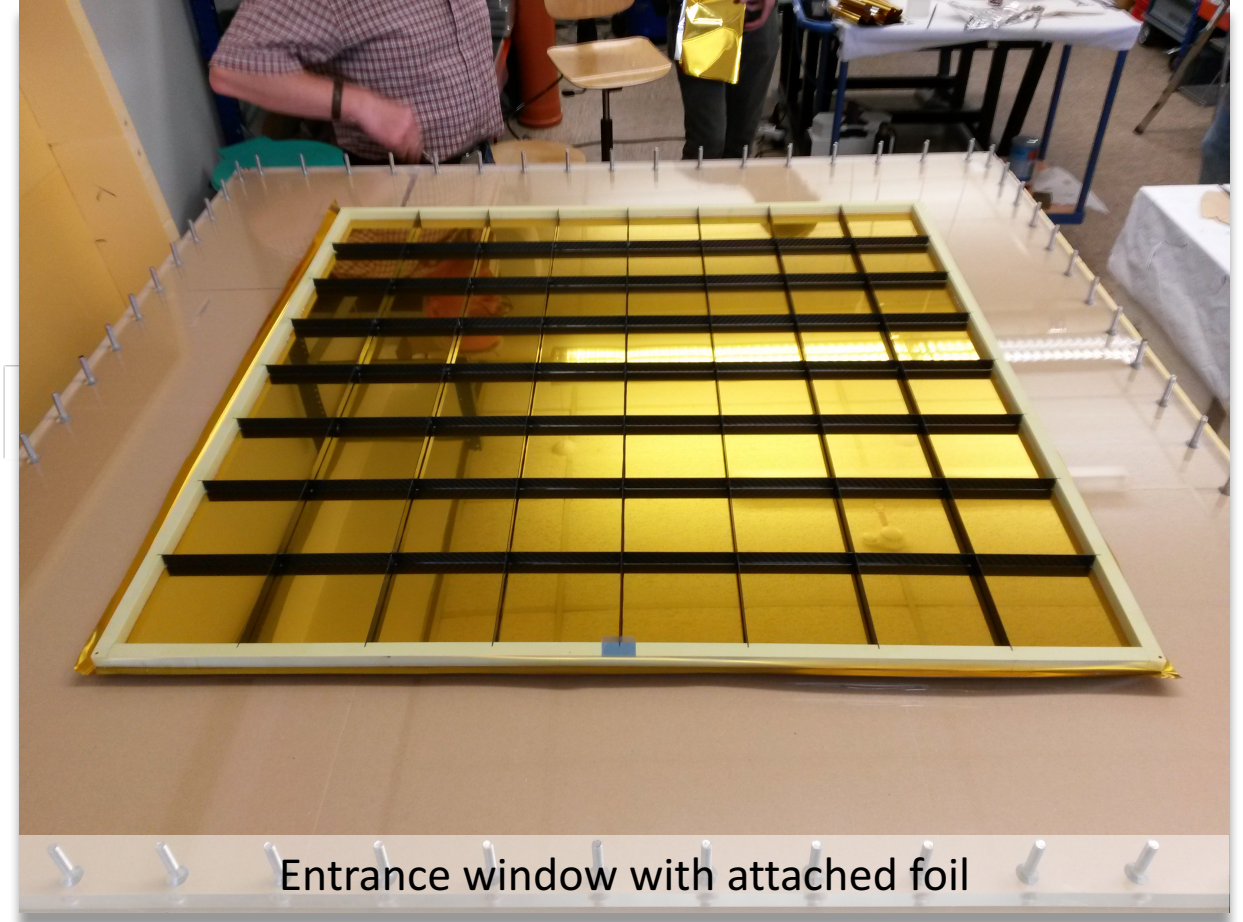
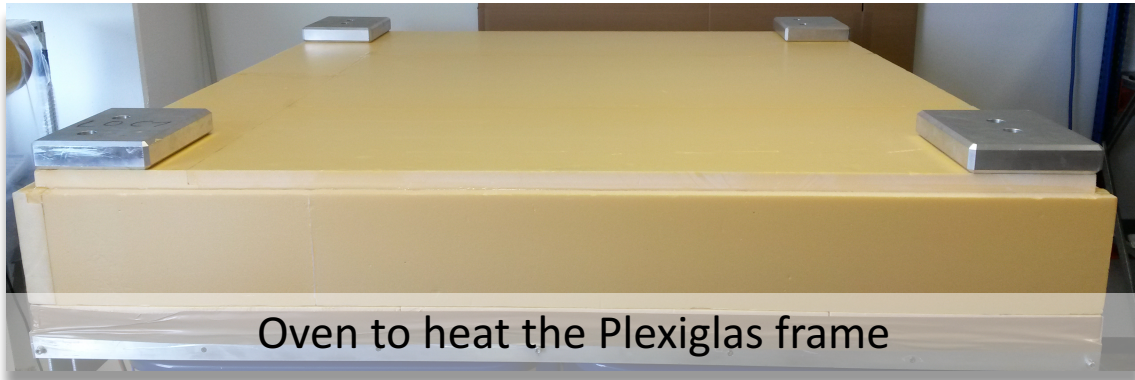
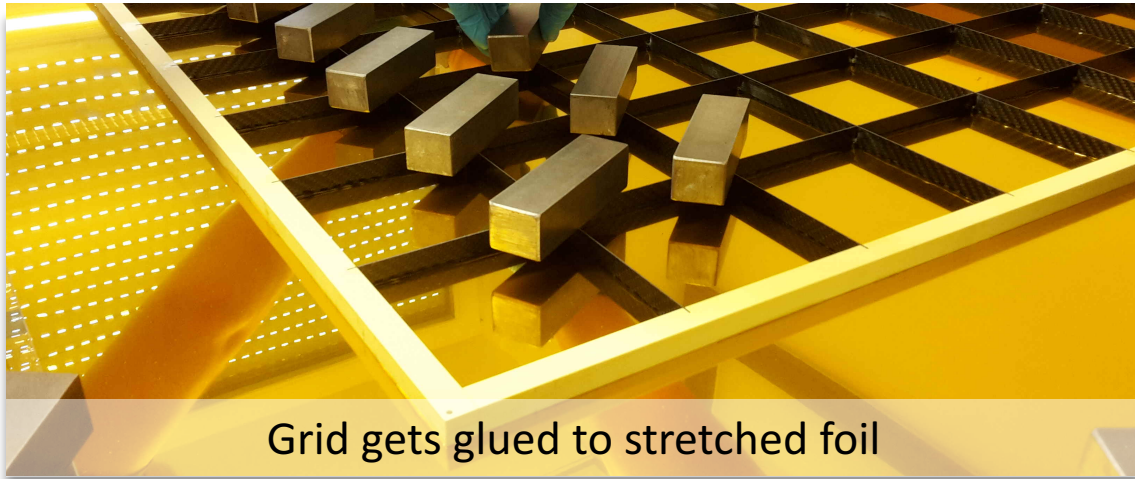
CHAMBER CONSTRUCTION

ENTRANCE WINDOW



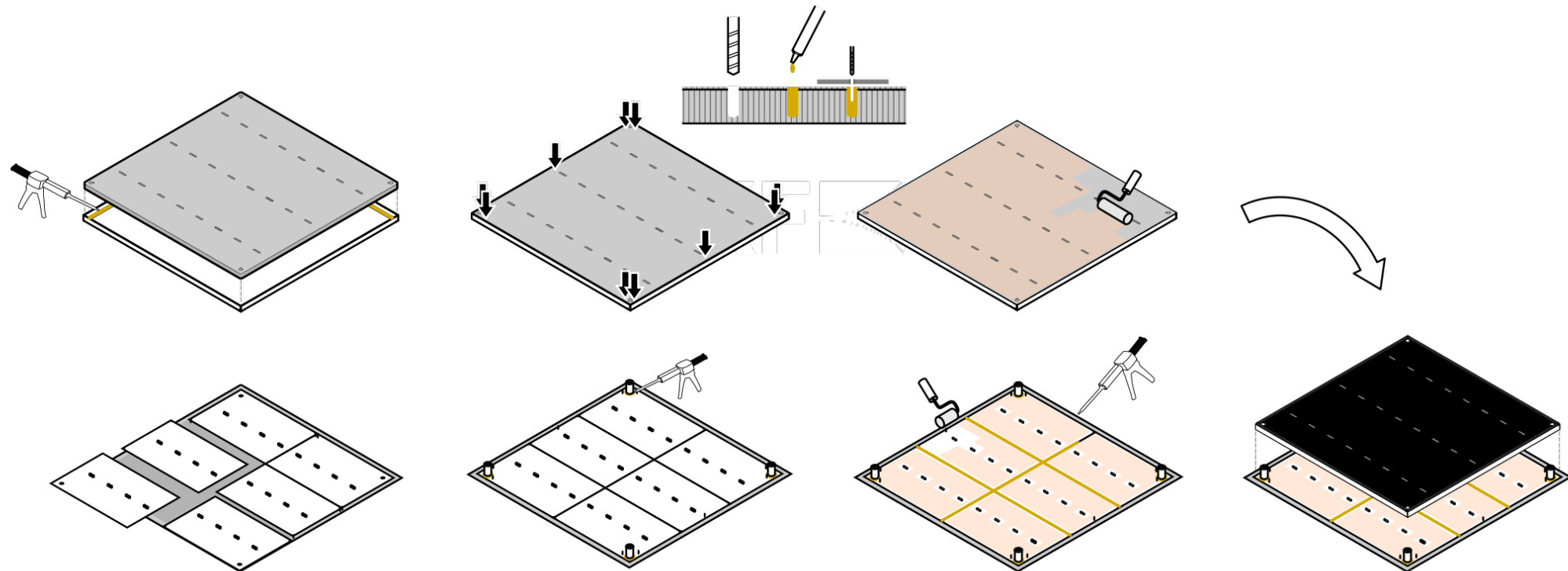
CHAMBER CONSTRUCTION

ENTRANCE WINDOW



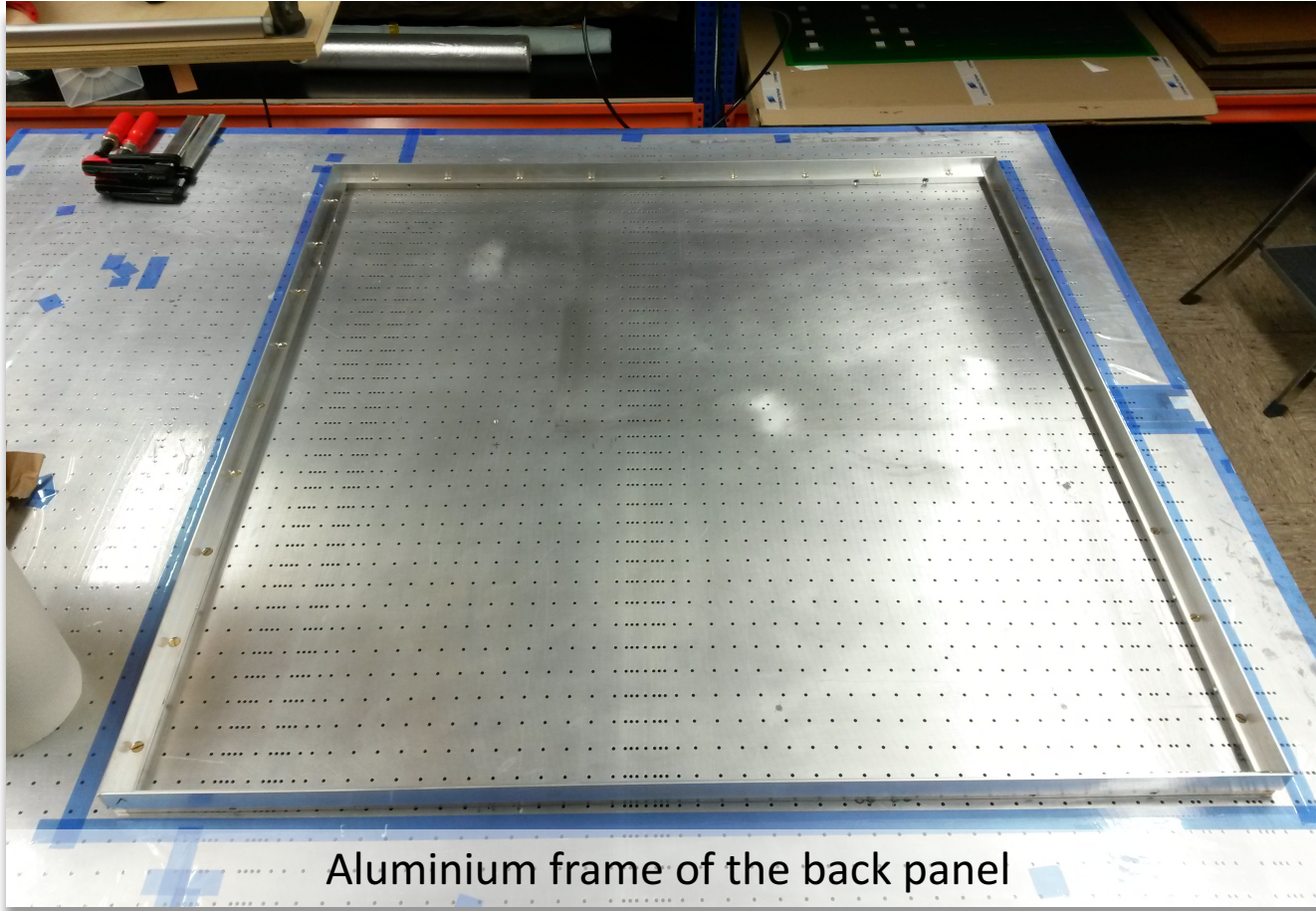
CHAMBER CONSTRUCTION

BACK PANEL

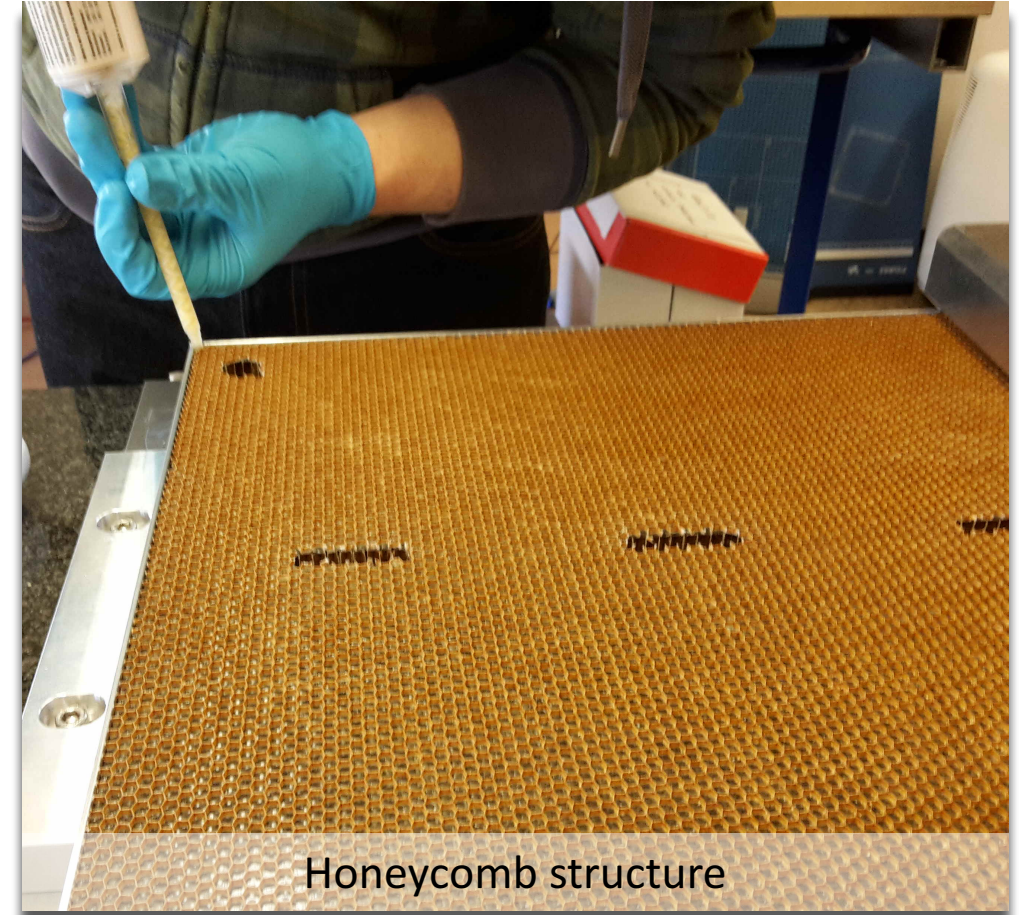


CHAMBER CONSTRUCTION

BACK PANEL



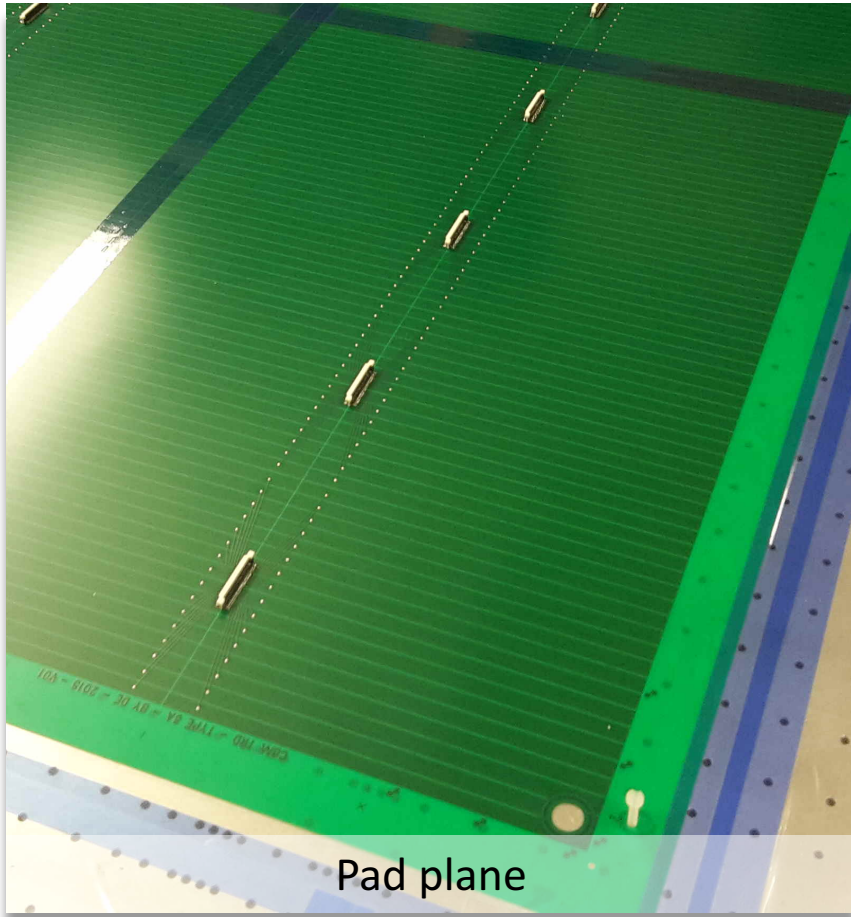
Aluminium frame of the back panel



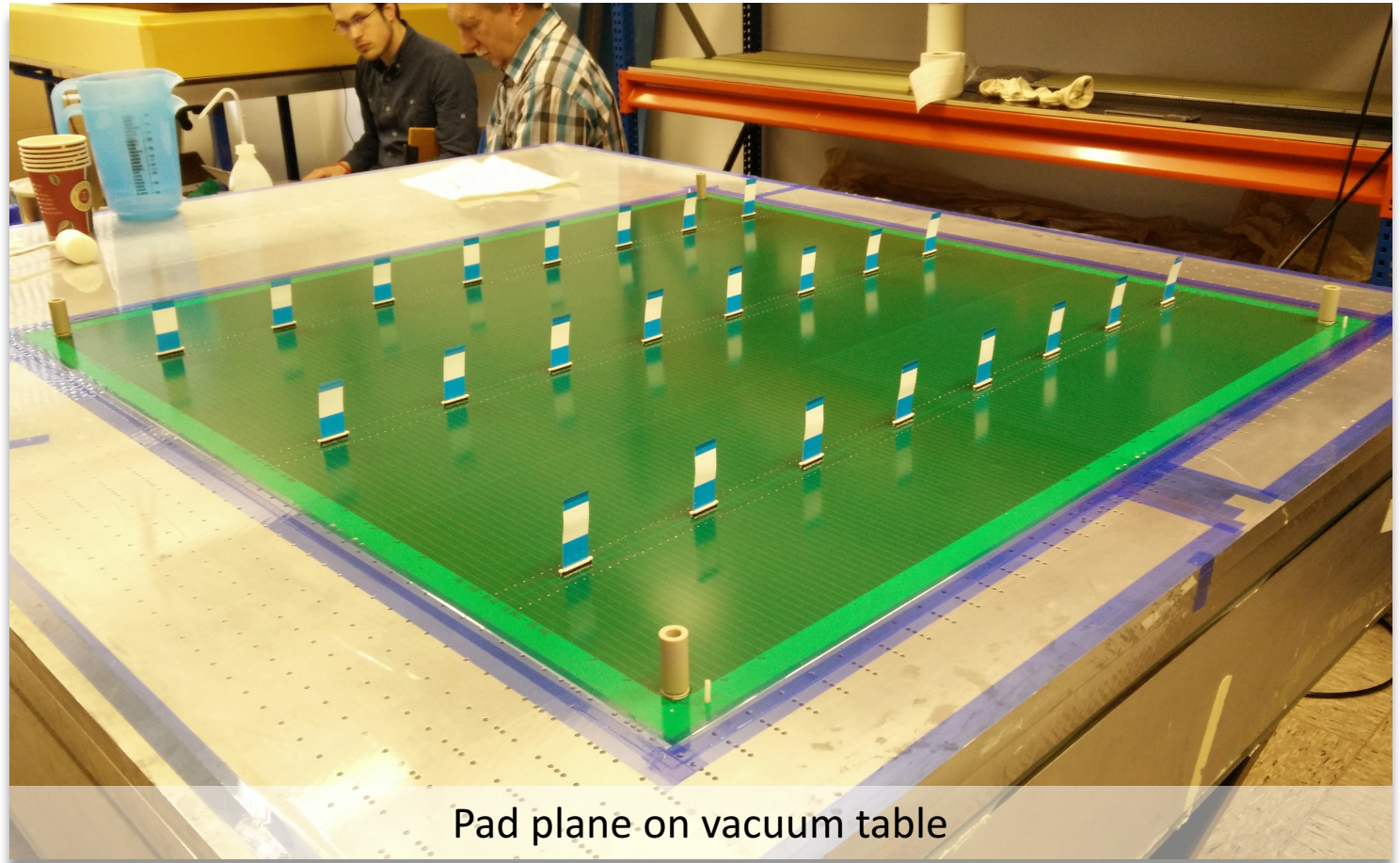
Honeycomb structure

CHAMBER CONSTRUCTION

BACK PANEL



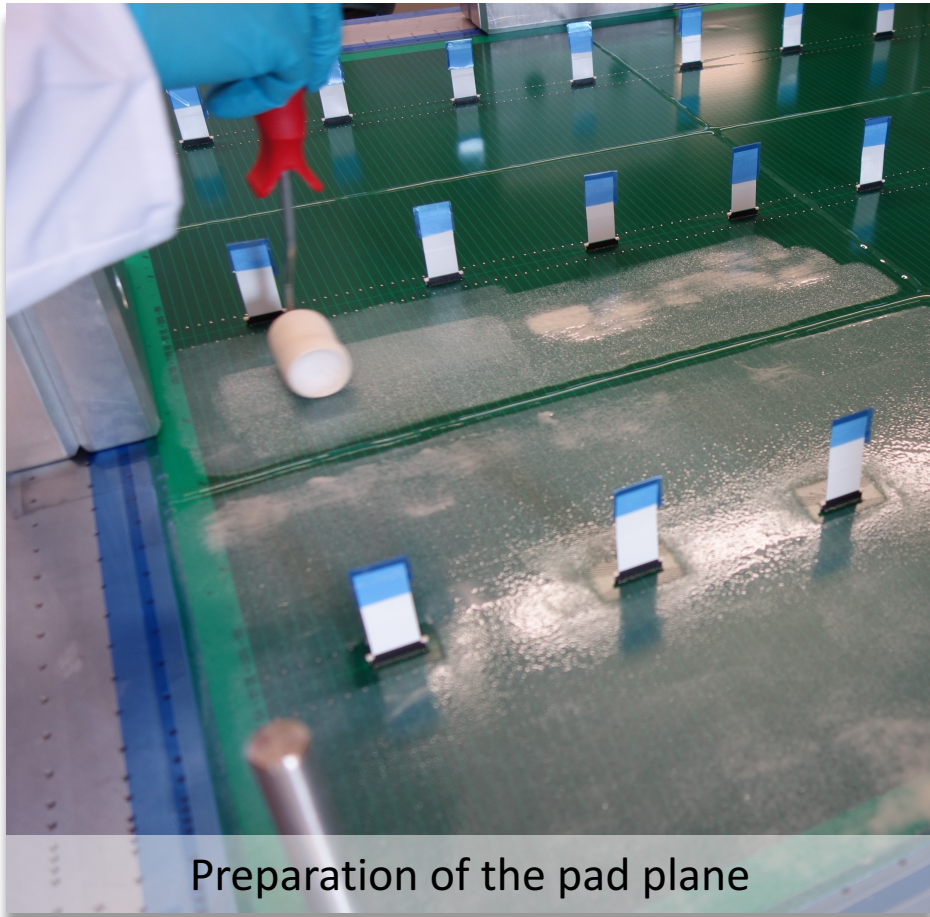
Pad plane



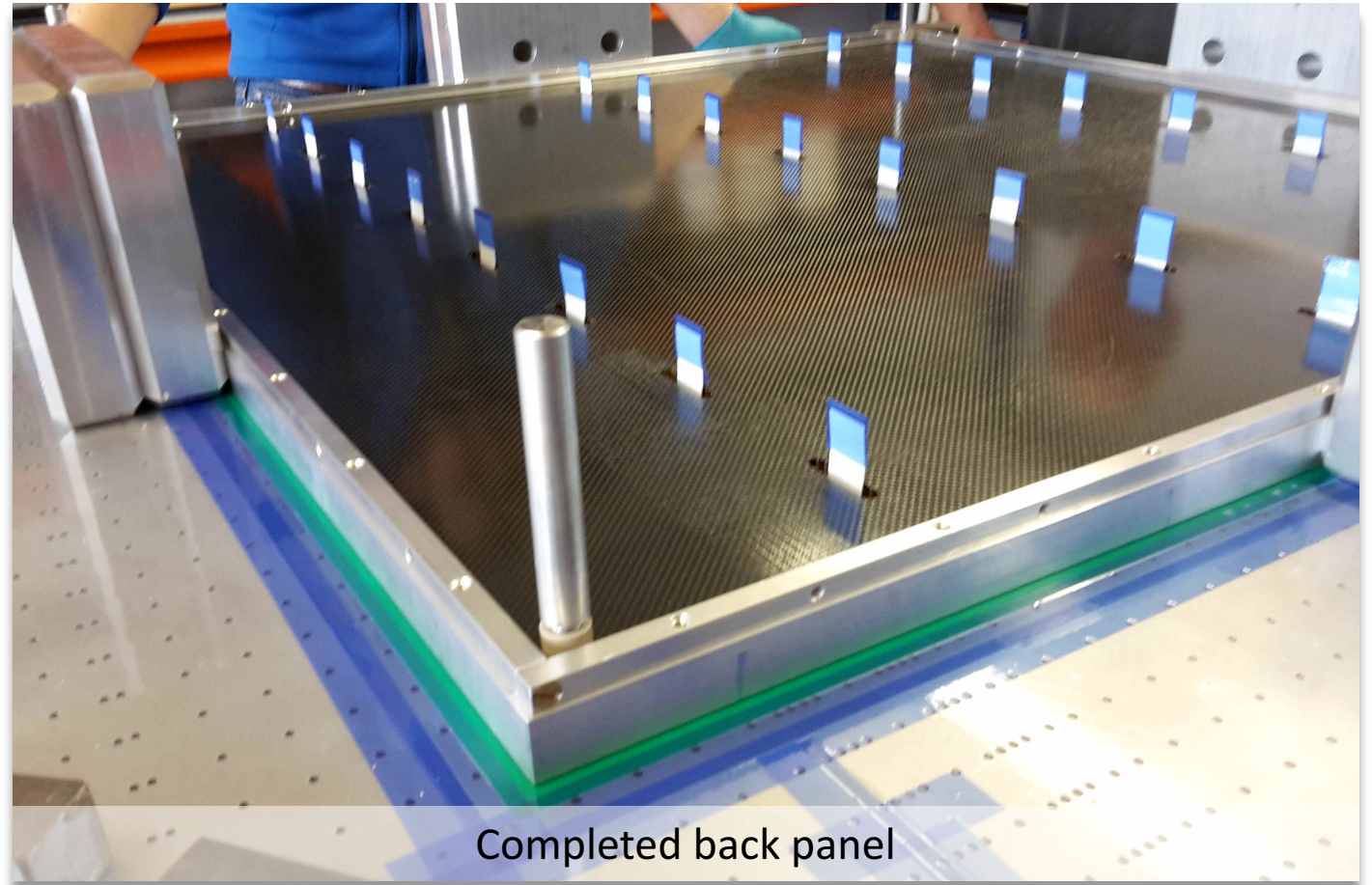
Pad plane on vacuum table

CHAMBER CONSTRUCTION

BACK PANEL



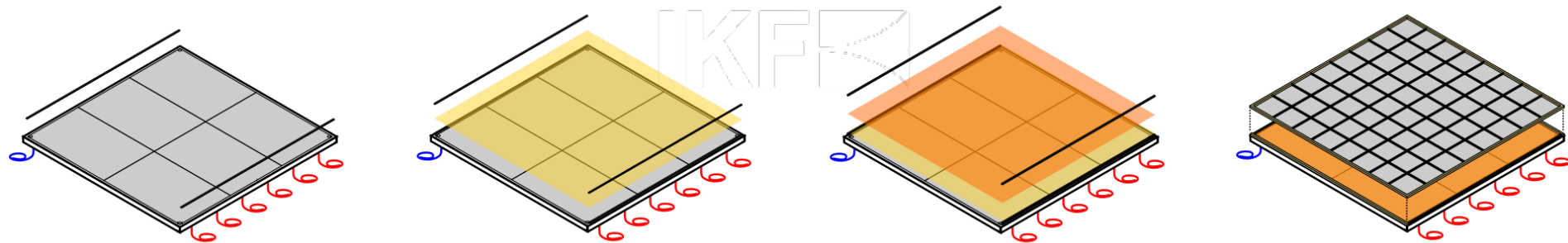
Preparation of the pad plane



Completed back panel

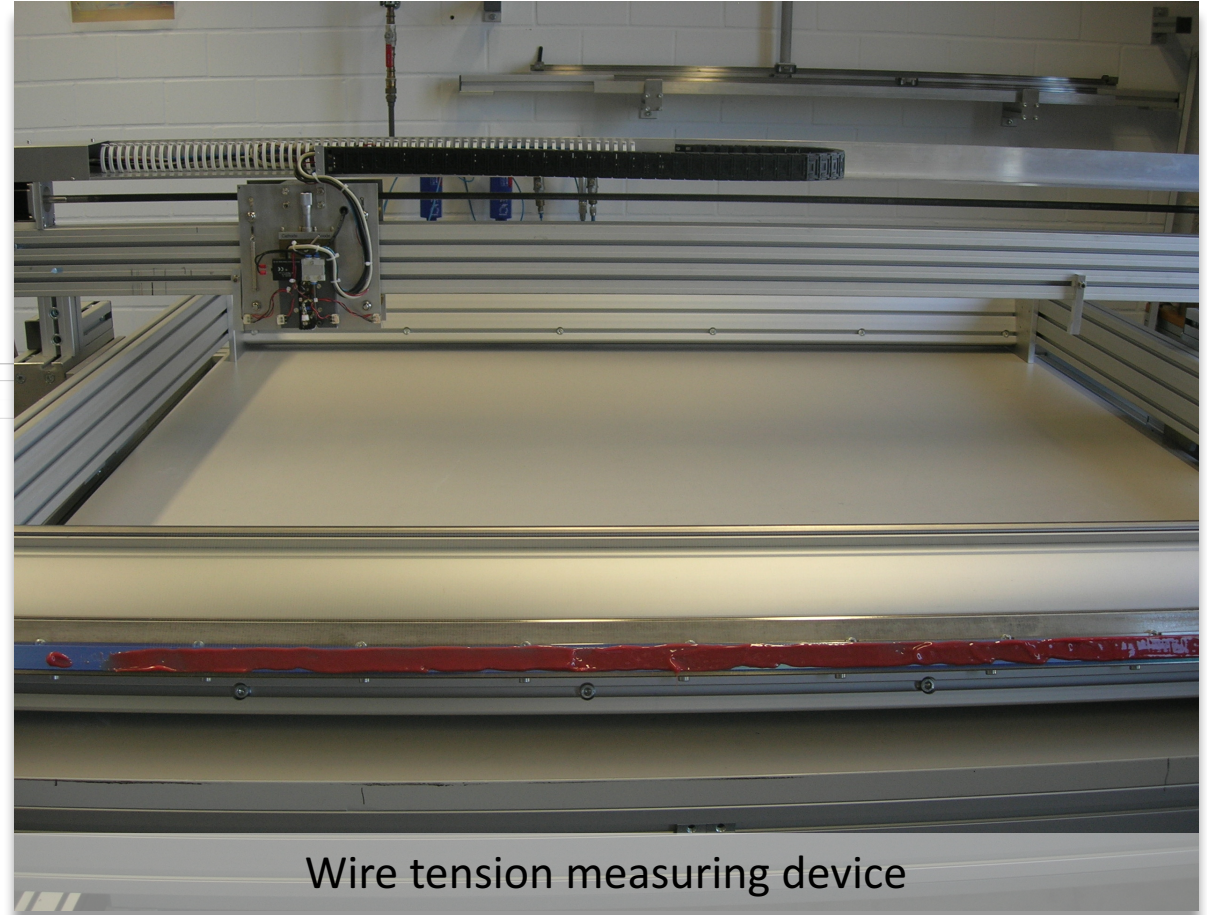
CHAMBER CONSTRUCTION

WIRE PLANES



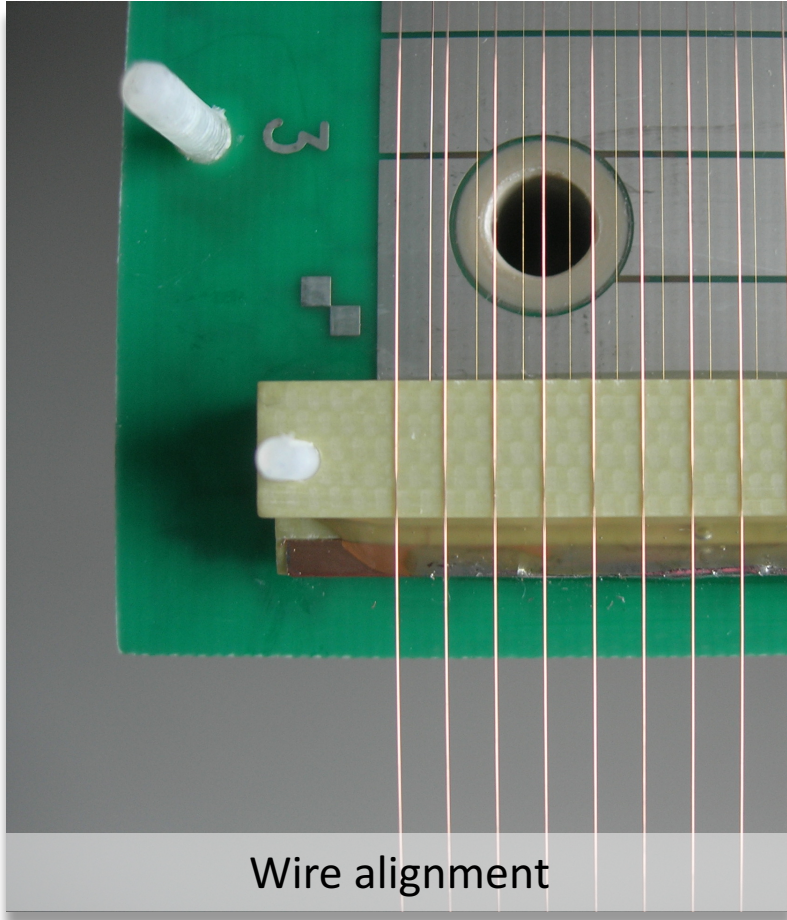
CHAMBER CONSTRUCTION

WIRE PLANES

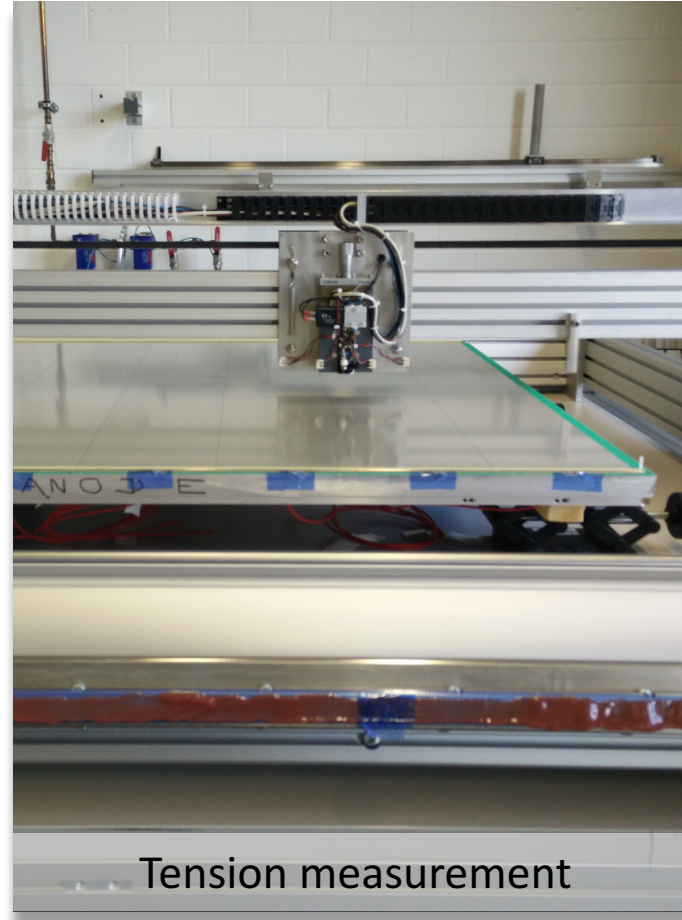


CHAMBER CONSTRUCTION

WIRE PLANES



Wire alignment



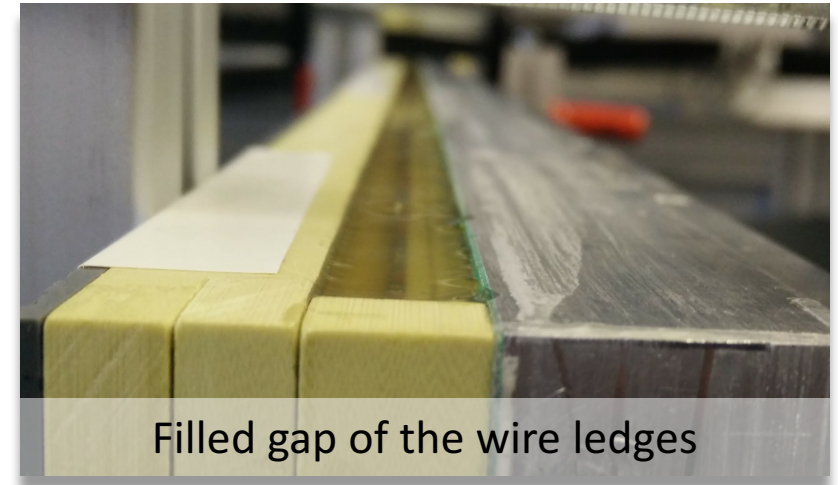
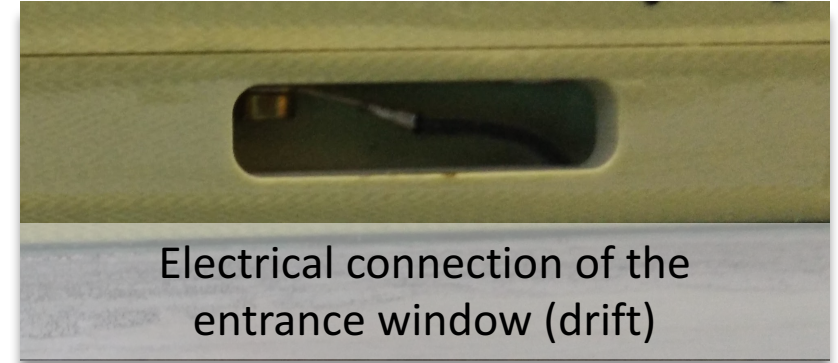
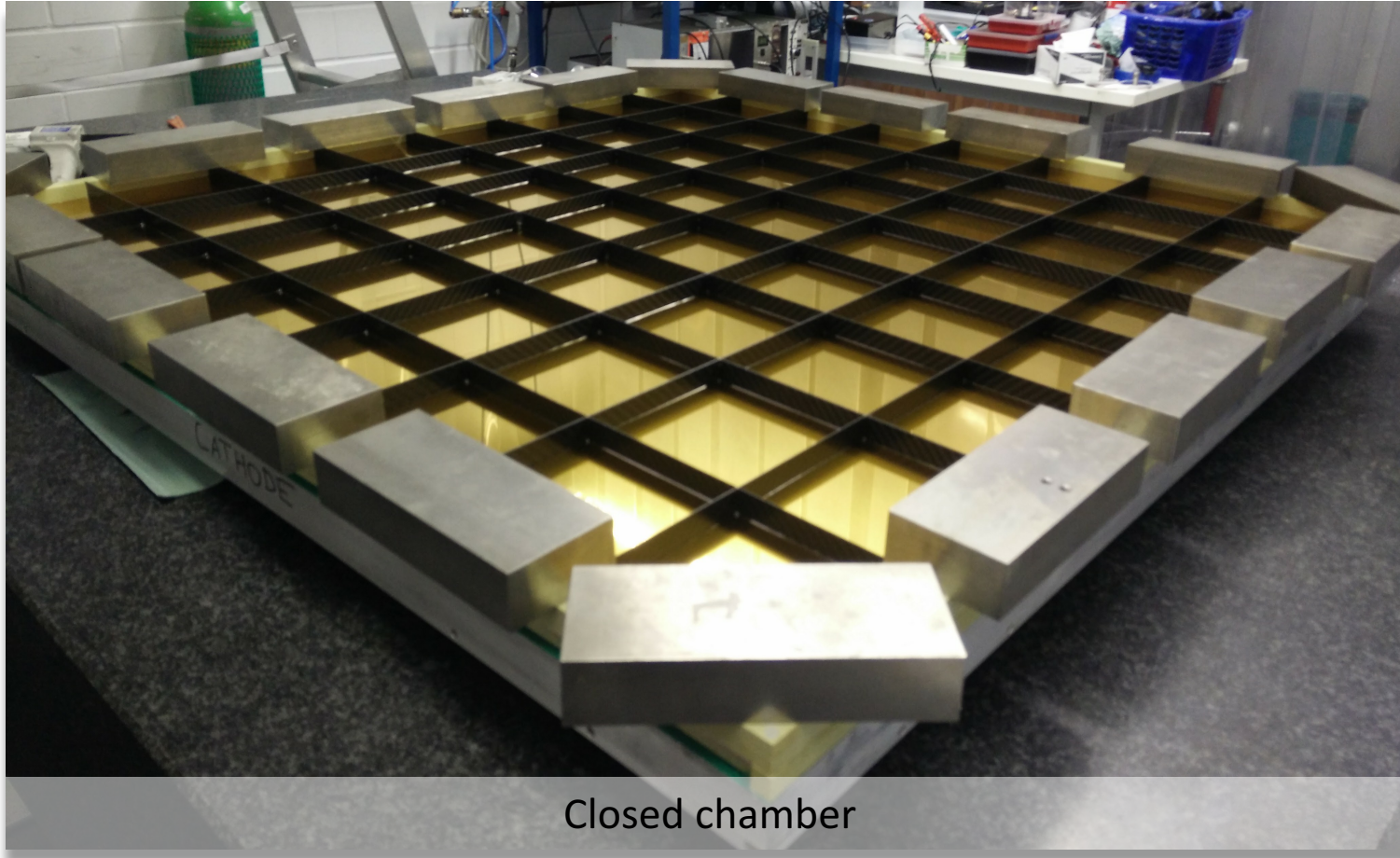
Tension measurement



Wire ledges

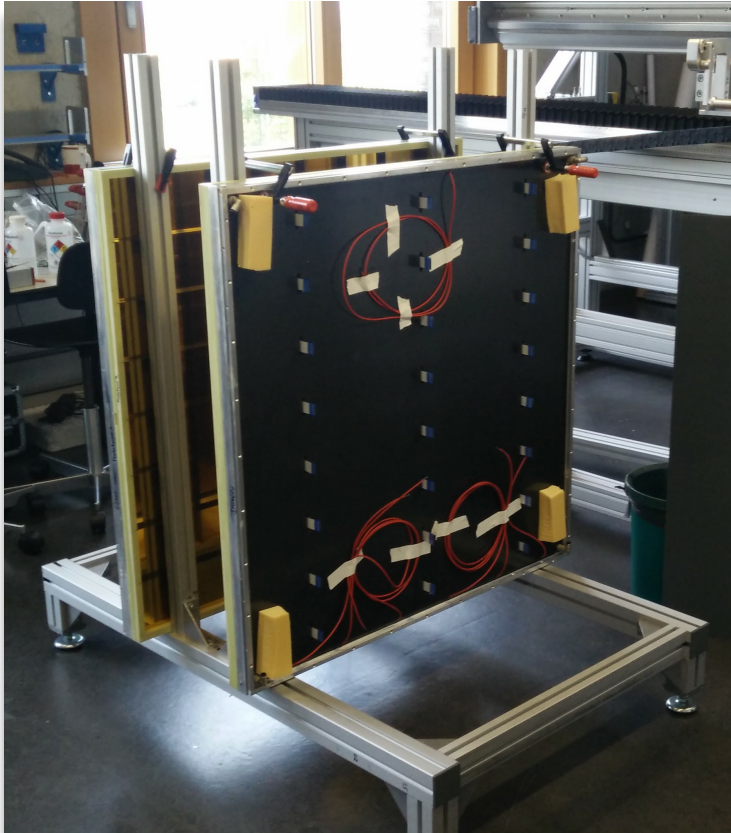
CHAMBER CONSTRUCTION

FINALISATION



CHAMBER CONSTRUCTION

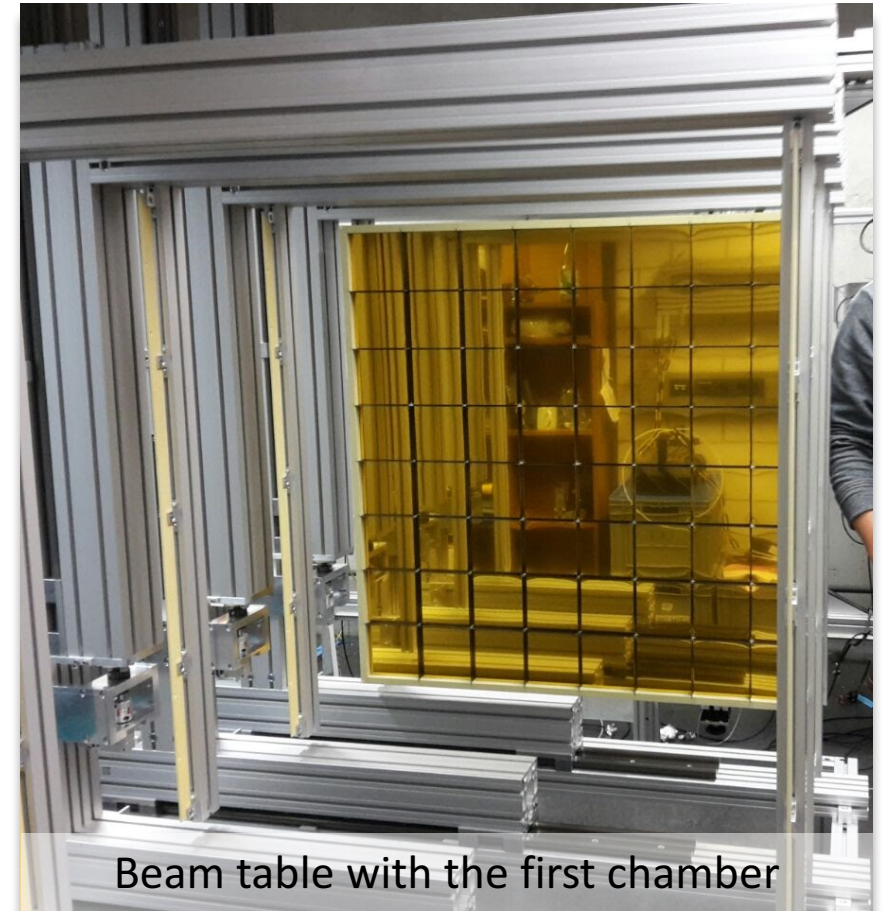
FINAL CHAMBER



Holding device with two chambers



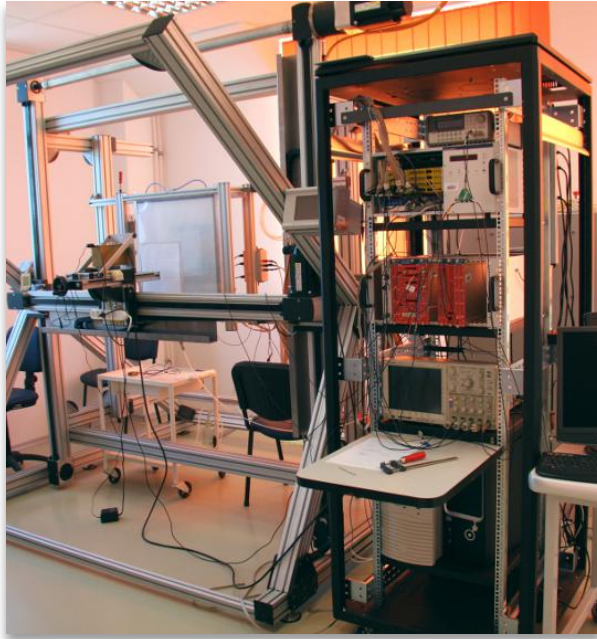
Beam table (SPS 2016)



Beam table with the first chamber

MACHINERY & FACILITIES

LABORATORIES



IFIN-HH
Bucharest



IKF
Frankfurt



IKP
Münster

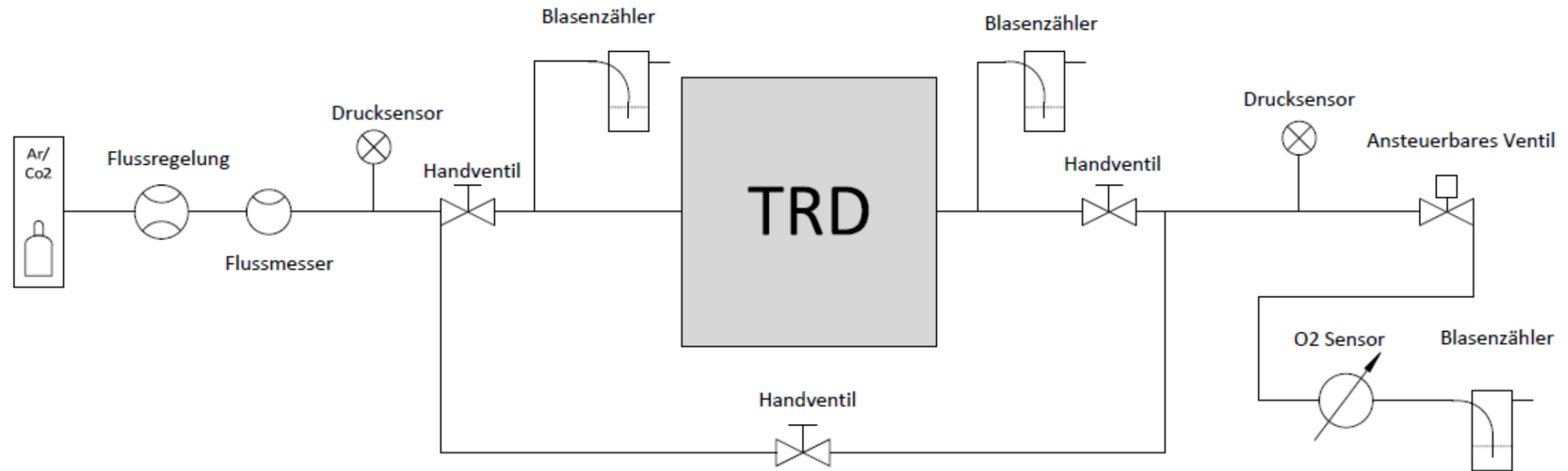
MACHINERY & FACILITIES

NEEDED EQUIPMENT

	IFIN-HH Bucharest	IKF Frankfurt	IKP Münster
Vacuum table	✓	✓	✓
Wire winding machine	✓	✓	✗ *
Wire tension measuring device	✓	✓	✗ *
Foil stretching equipment	✓	✓	✓
Sufficient space / clean room	✓	✓	✓

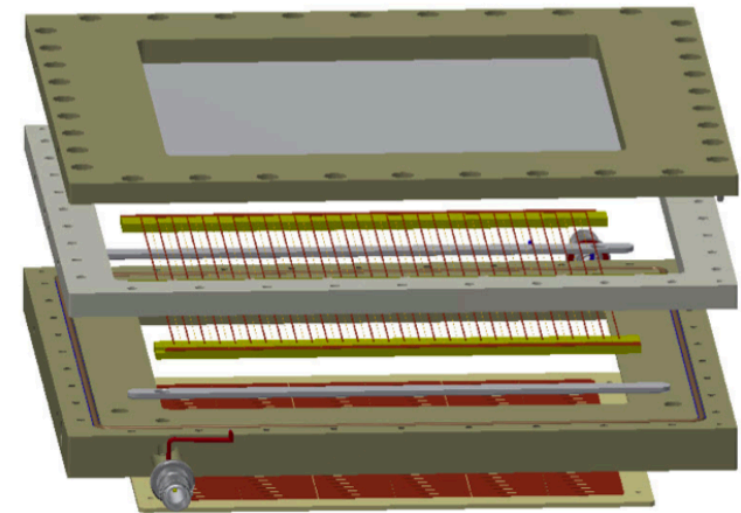
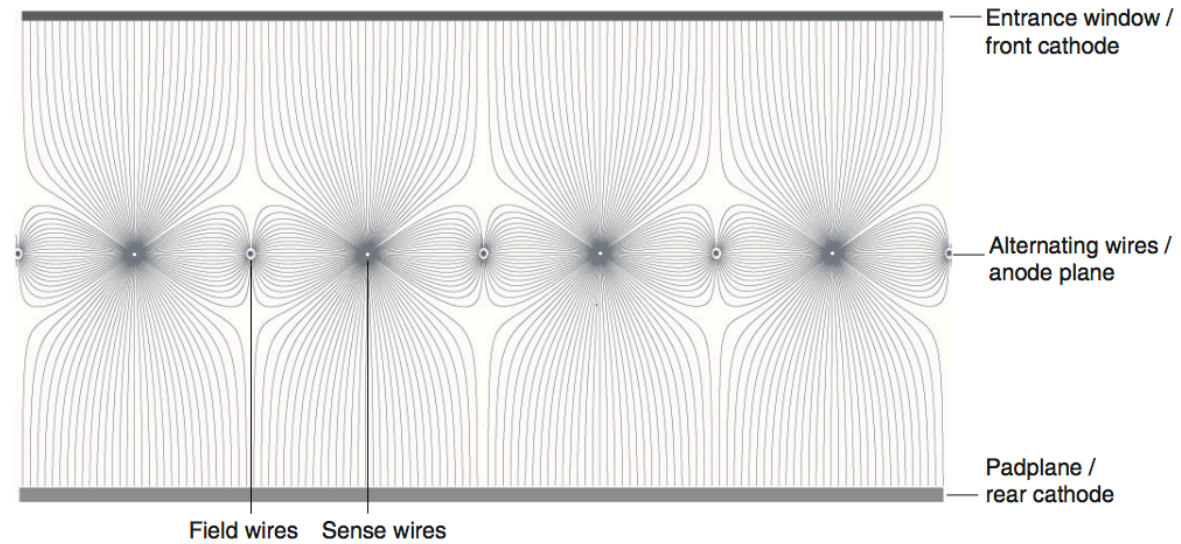
* All needed parts for a second wire winding machine and a wire tension measuring device are available in Frankfurt





BACKUP

PROTOTYPE WITH ALTERNATING WIRES



BACKUP

PROTOTYPE WITH ALTERNATING WIRES

