

Openable Cell for Pax

- **Requirements**
 - High figure of merit.
 - Transparency to reaction products
 - » Teflon Walls
 - **Operation in AD**
 - » Openable Cell
 - Easy exchange

The openable easy exchangeable teflon cell.

Early development and knowledge

• Cell of Hermes

- Aluminum cell
 - Dryfilm Coating
 - Spot Welded
 - Cooled with He

I_{ABS}	Thickness	P
$10^{16} \text{ s}^{-1} 10^{13} \text{ cm}^{-2}$		
	calc. / meas.	
6.5 Lc HF		85%
⊥ 6.5 mc	11.2/11	78%

• Cell Julich

- Aluminum Cell

- Teflon coating
- Continuous foil with

3.3 / 2.7

76%

open slit

7.8

7.5

3.8

2.9 / 2.7

8.5

$D_{\text{ABS tube}}$

10 mm

15 mm

• Cell IUCF

- Teflon cell

- Teflon foil formed on a Al structure

- We'll design our prototype this cell

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3.0

3.4 / 3.5

75%

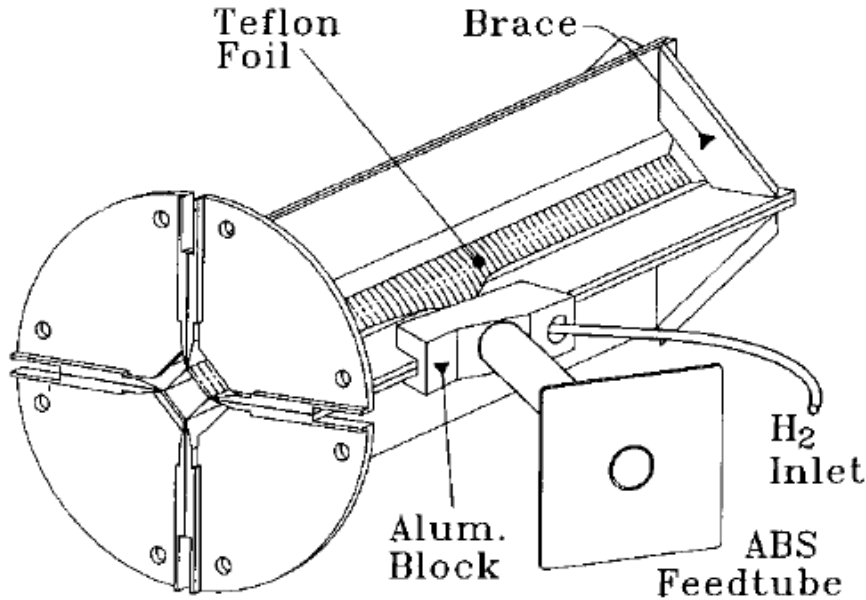
t

father ... and son

10 x 10 x 400 mm³

P= 75%

**T_c = 8.5 10¹³ at/cm²
estimated**

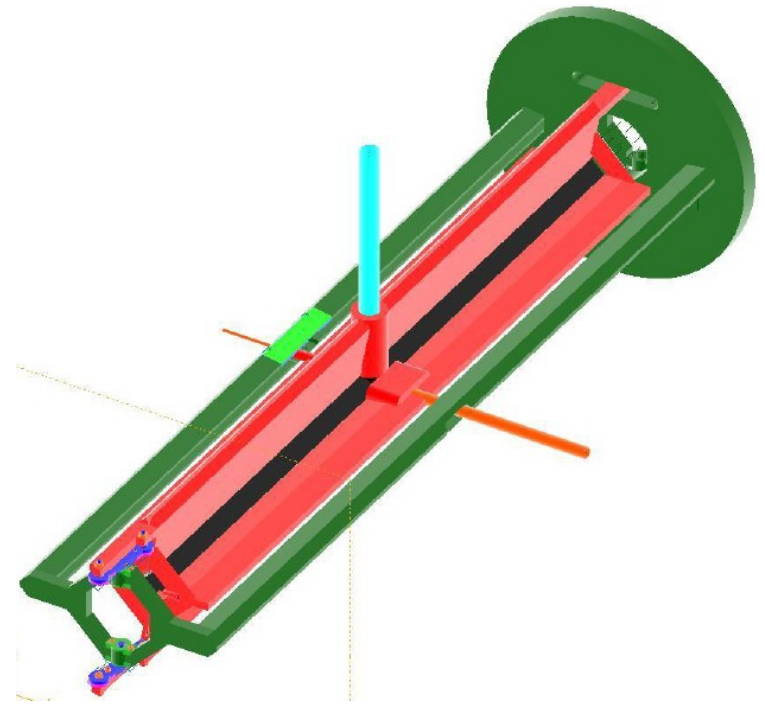


8 x 8 x 250 mm³

P= 75%

T_c = 3.4 10¹³ at/cm²

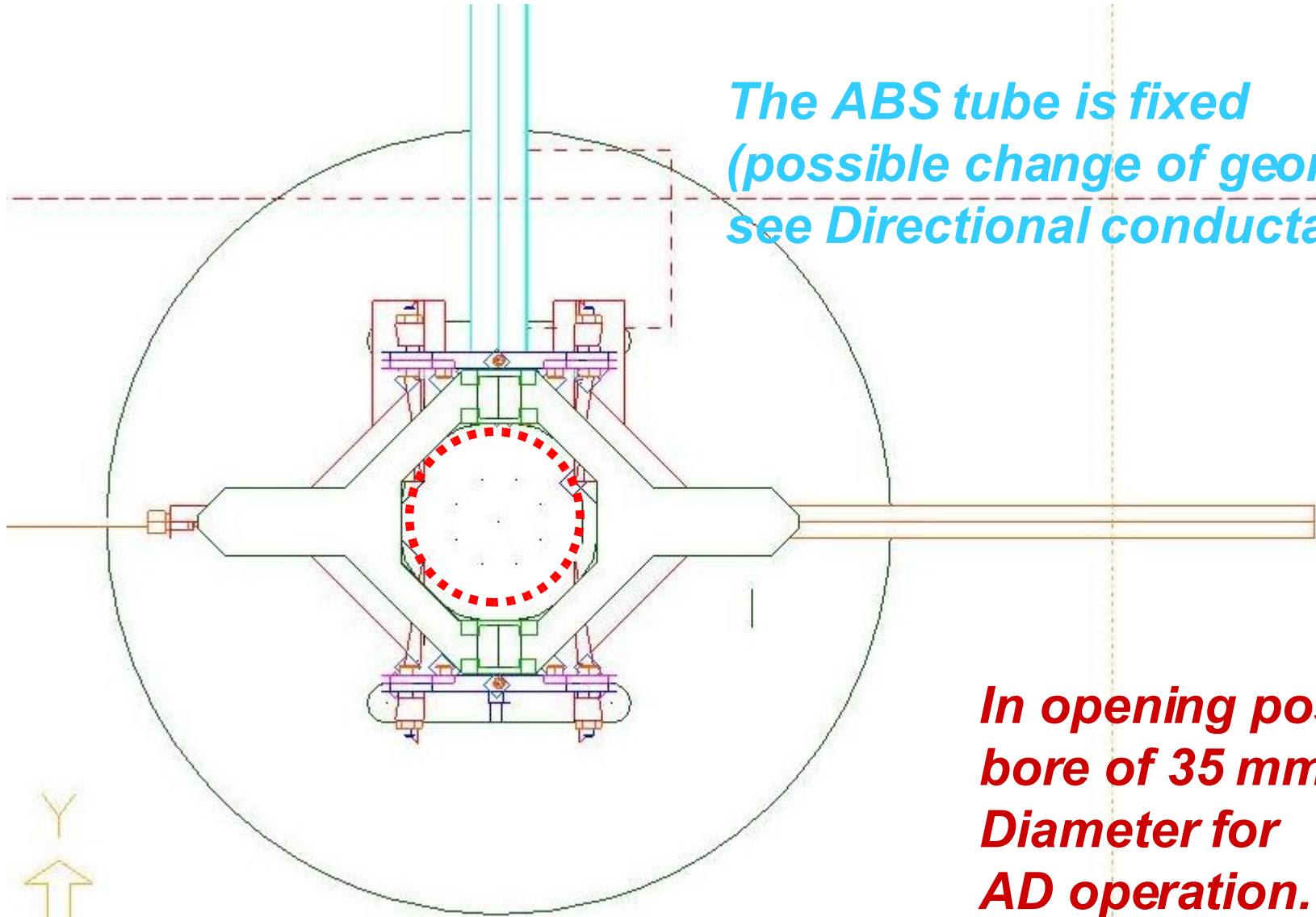
Estimated and measured



Design of openable cell

Link to Vito animation

Openable cell



*The ABS tube is fixed
(possible change of geometry,
see Directional conductance)*

*In opening position,
bore of 35 mm in
Diameter for
AD operation.*

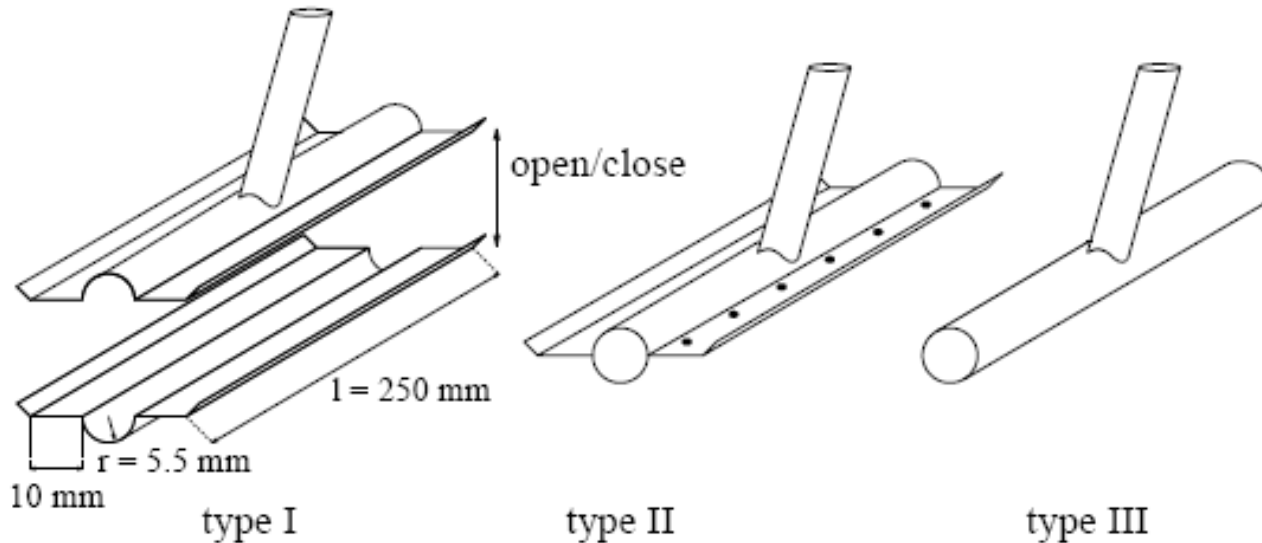
Problem on openable cell

- **Cell configurations tested in FILTEX.**

» FEP 120

FEP 120

TPFE3170



- **P Injecting 2 substates**

0.283

0.349

0.440

- **P Injecting 1 substates**

n.m.

n.m.

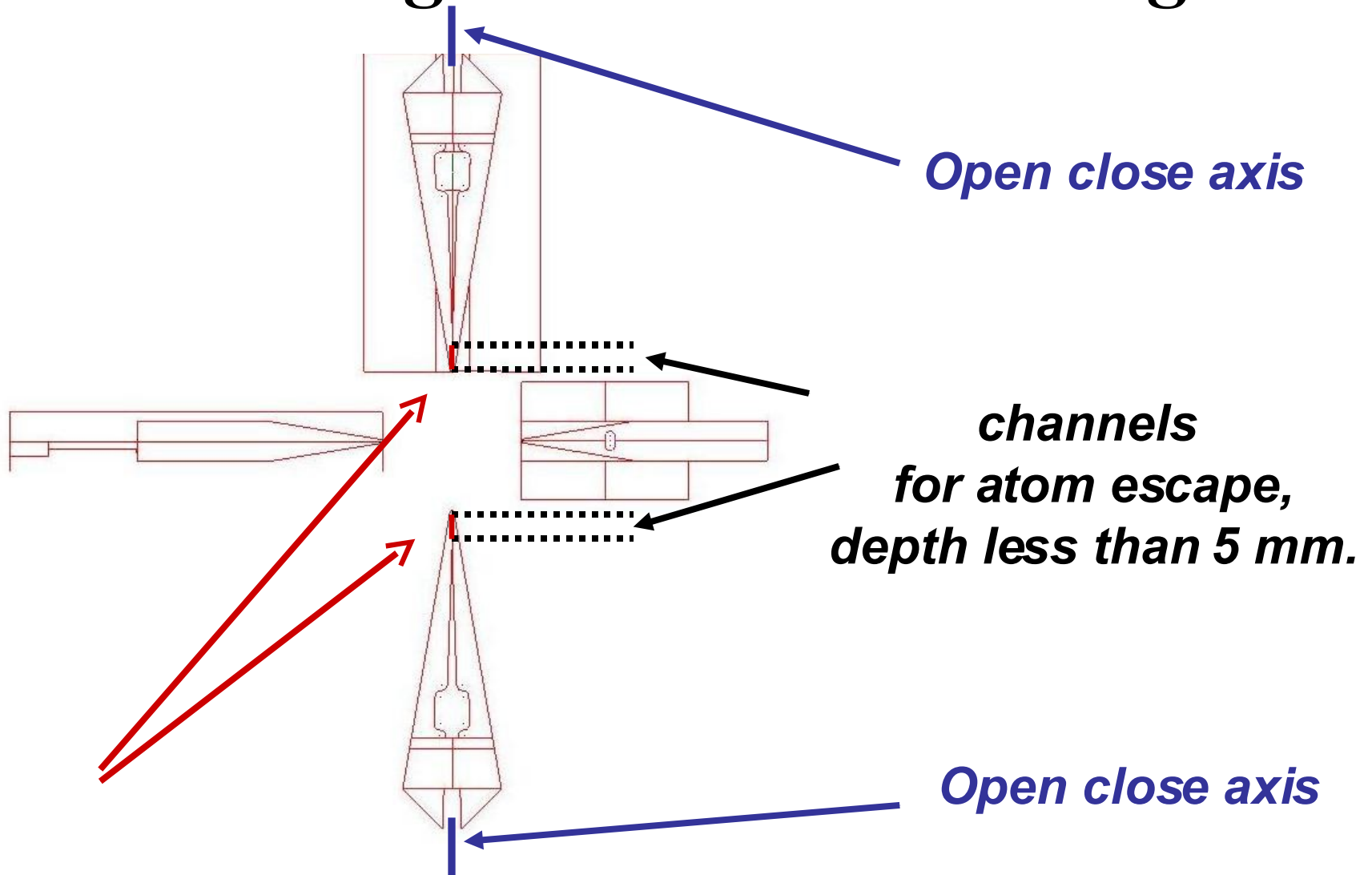
0.82

detreamental factors

- **Avoid any trapping “spot”**
- H trapping: recombination & depolarization
 - » It is better to loose an atom than reinject it after recombination and/or depolarization
 - » $FoM = f n P^2$
- **Slits are anavoidable in an openable cell.**
 - Following the extimation of Steffens on
 - » Limit on slit opening along the cell
 - &
 - » Limit on depolarization

REQUERIMENTS: Slit of width <0.2 mm and depth < 5mm.

Drawing: details on matching



Open close axis

*channels
for atom escape,
depth less than 5 mm.*

Open close axis

... width < 0.2 mm or 0.

Test and work in progress

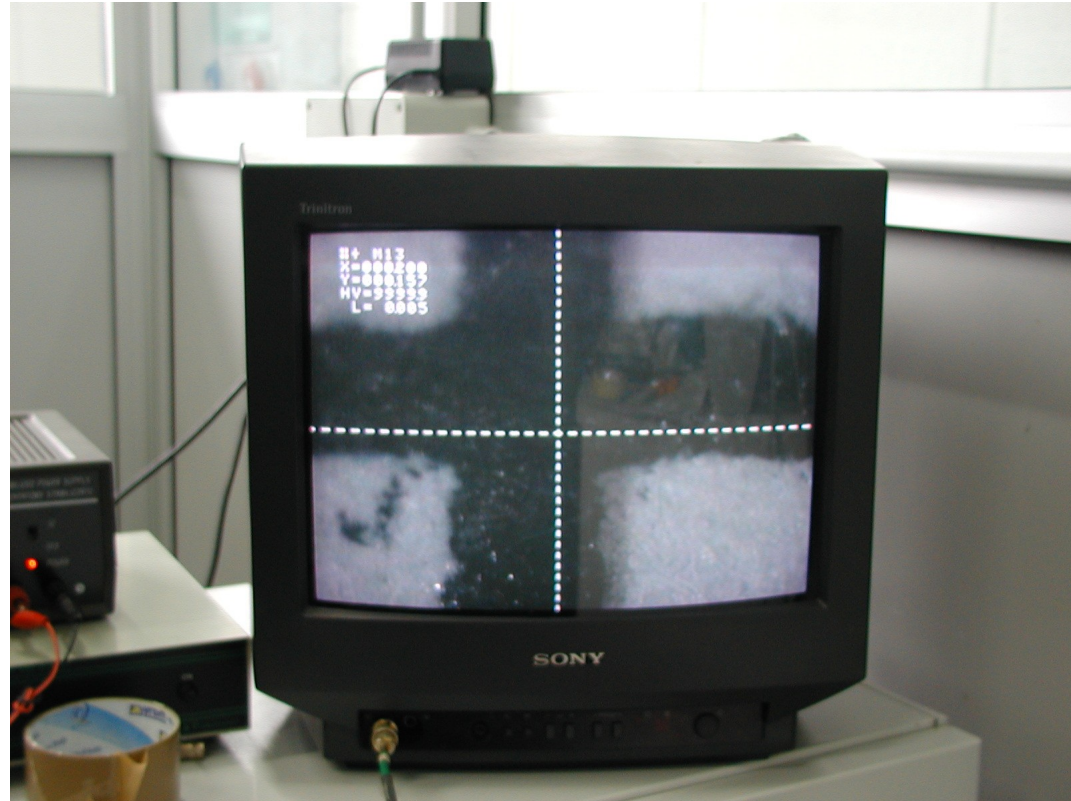
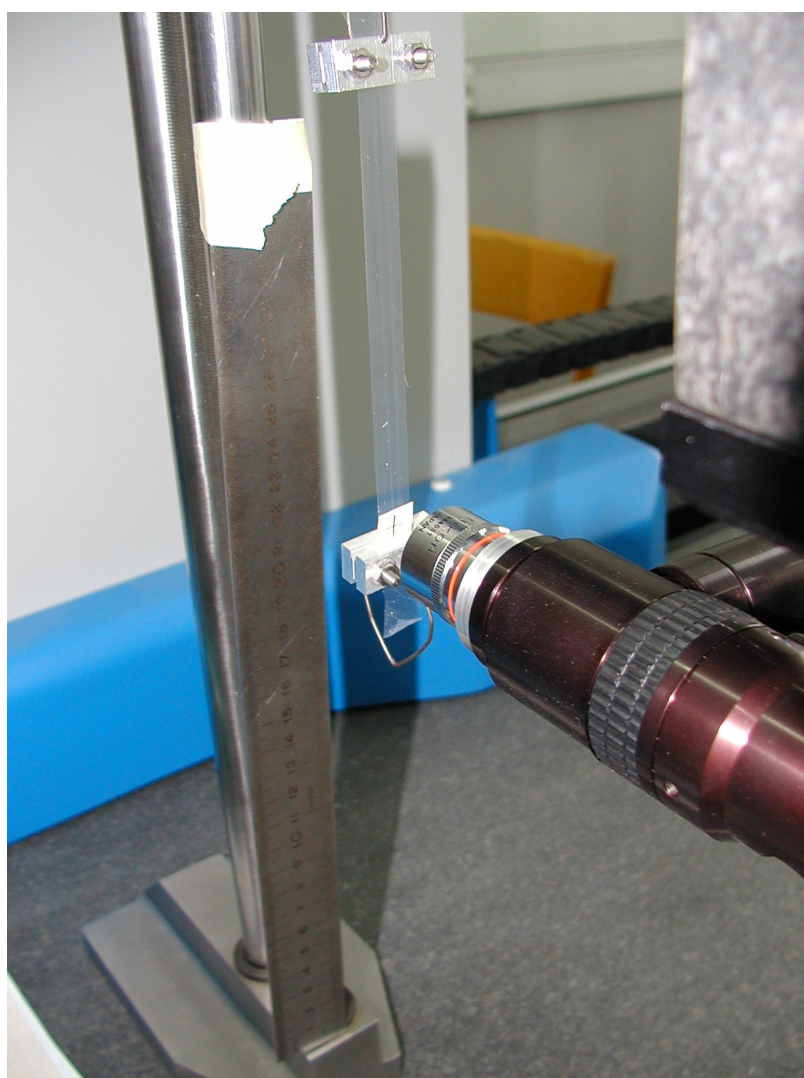
- **Mechanical test**

- Test on teflon elasticity.

- Test on bearings.

- Test on teflon foil shaping,
fitting also ABS and Sampling tube.

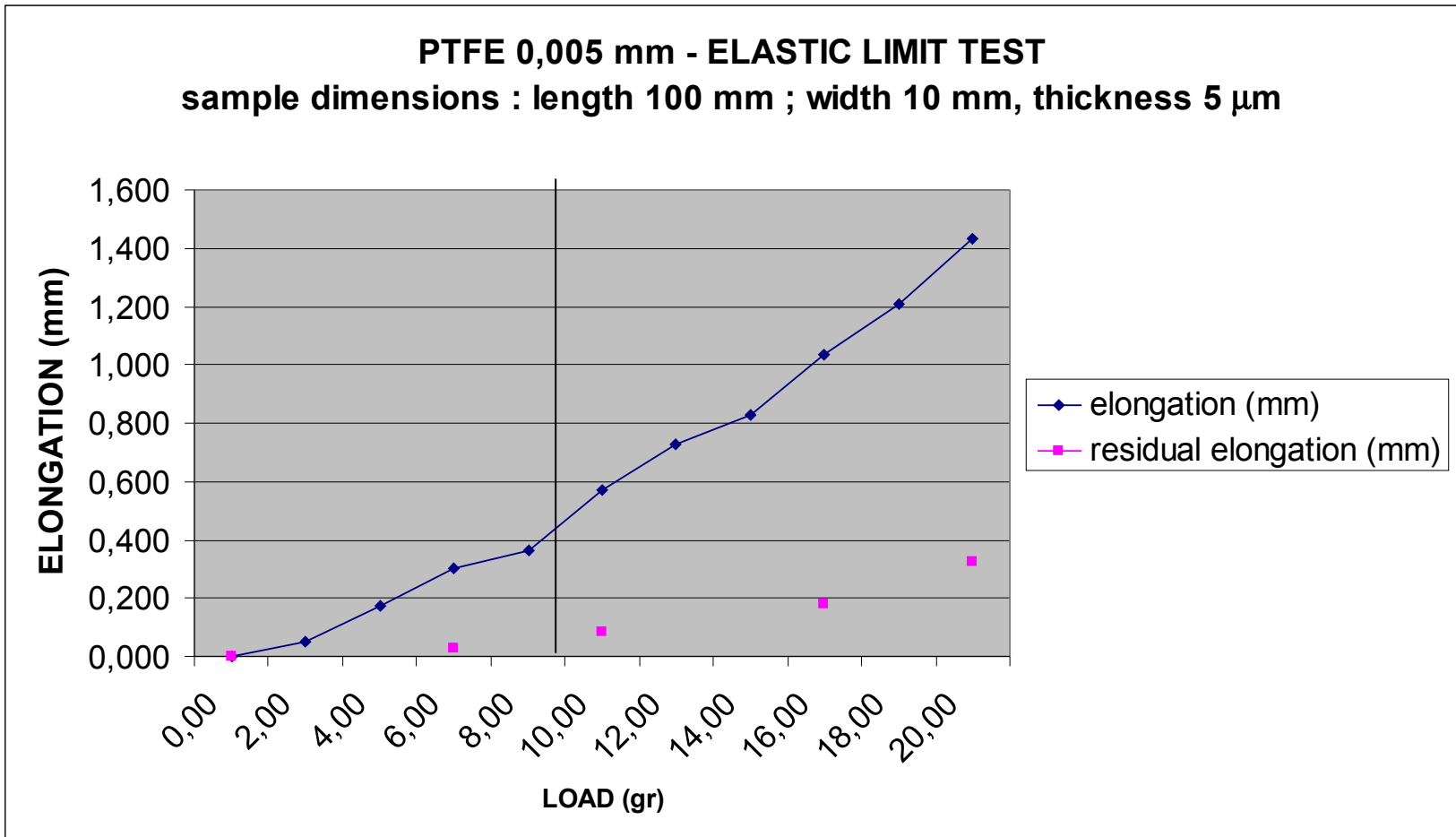
Teflon elongation test



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Elasticity



Test on bearing

17000 cycles in vacuum (10^{-6} mbar) without lubricant.

Before



After

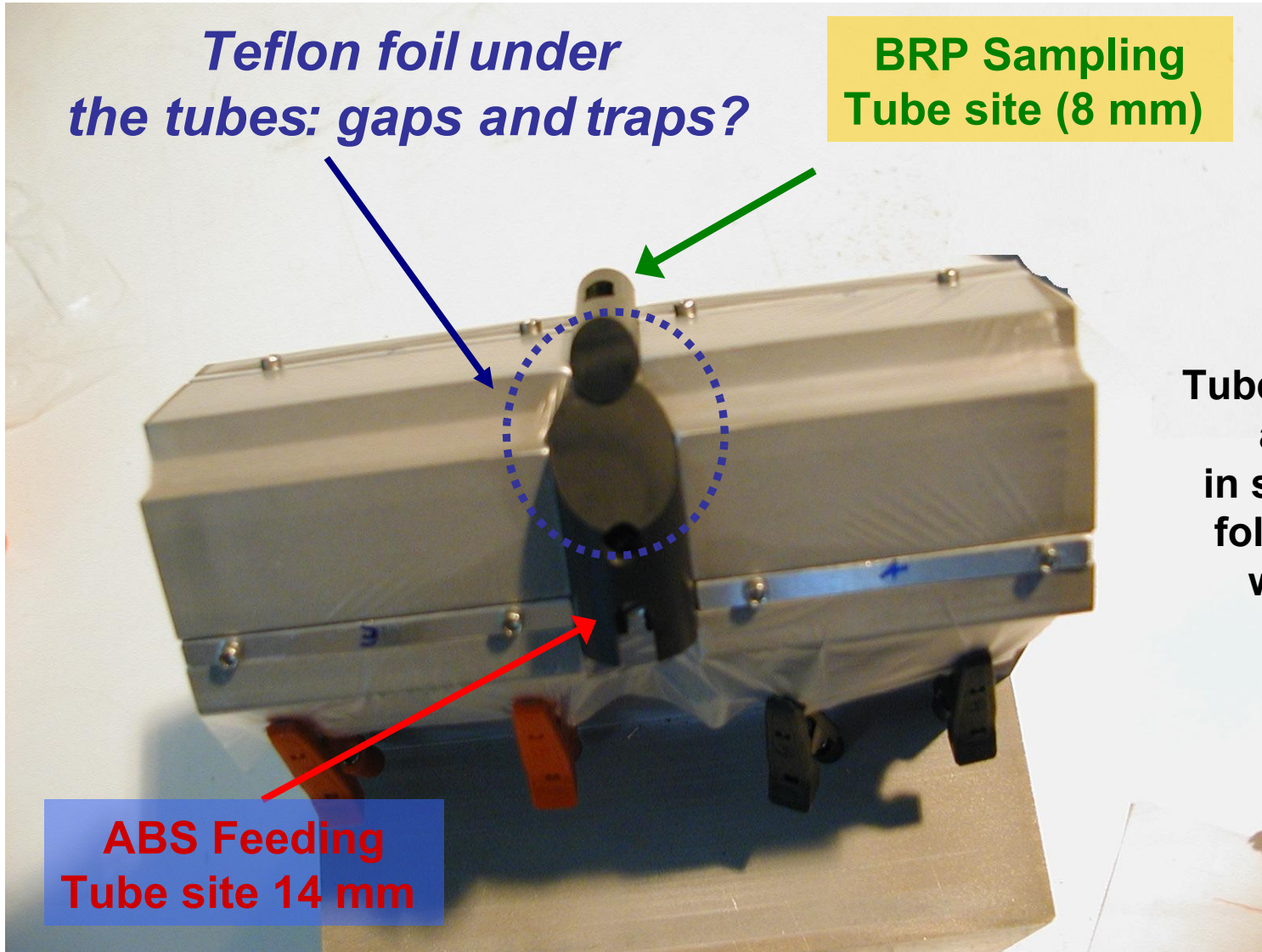


Bearings 2 mm inner diameter.
Spheres 0.2 mm

1 Test on teflon shaping.

*Teflon foil under
the tubes: gaps and traps?*

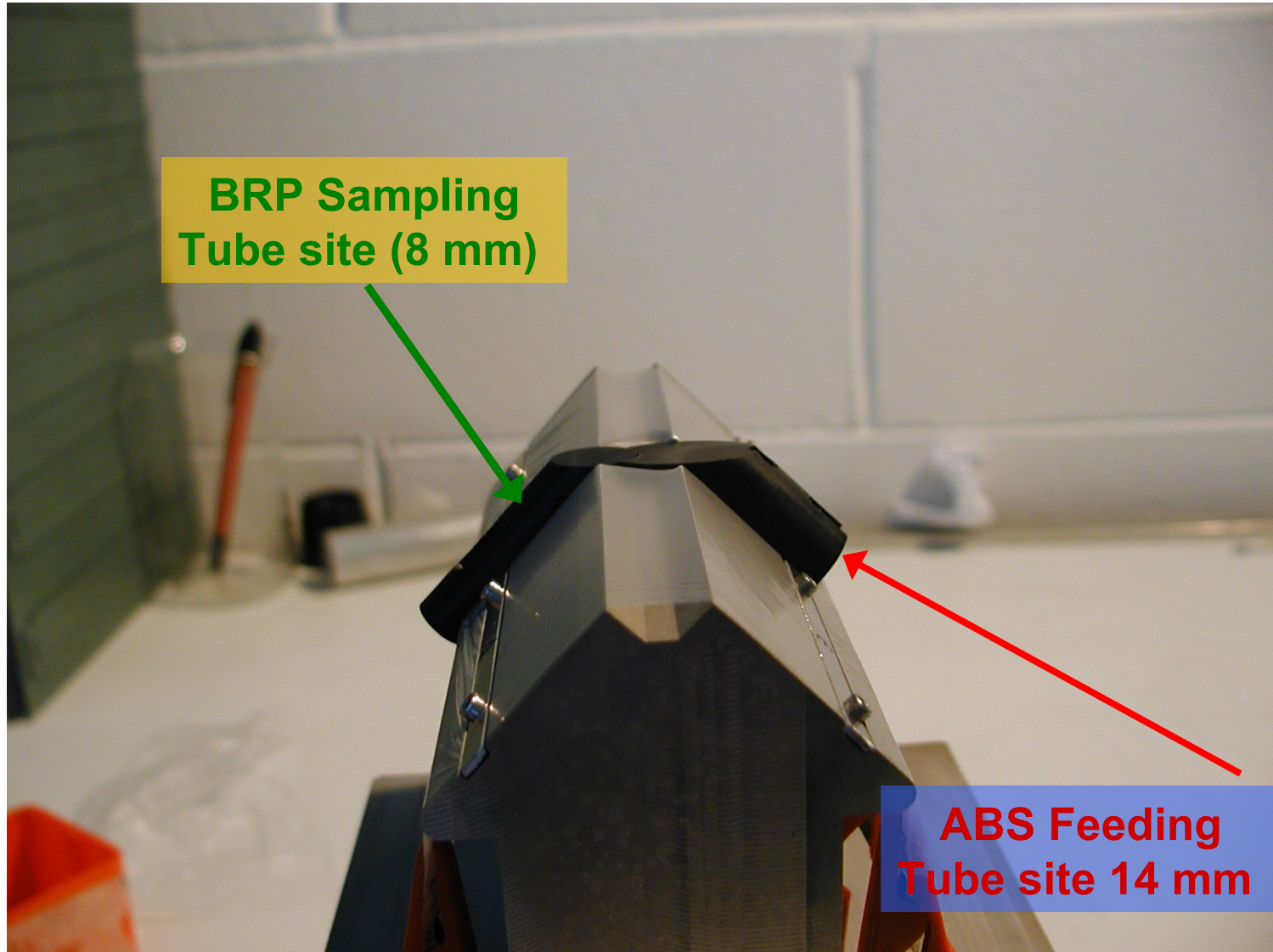
**BRP Sampling
Tube site (8 mm)**



**ABS Feeding
Tube site 14 mm**

**Tubes are shaped
at the end
in such a way to
follow the cell
wall profile.**

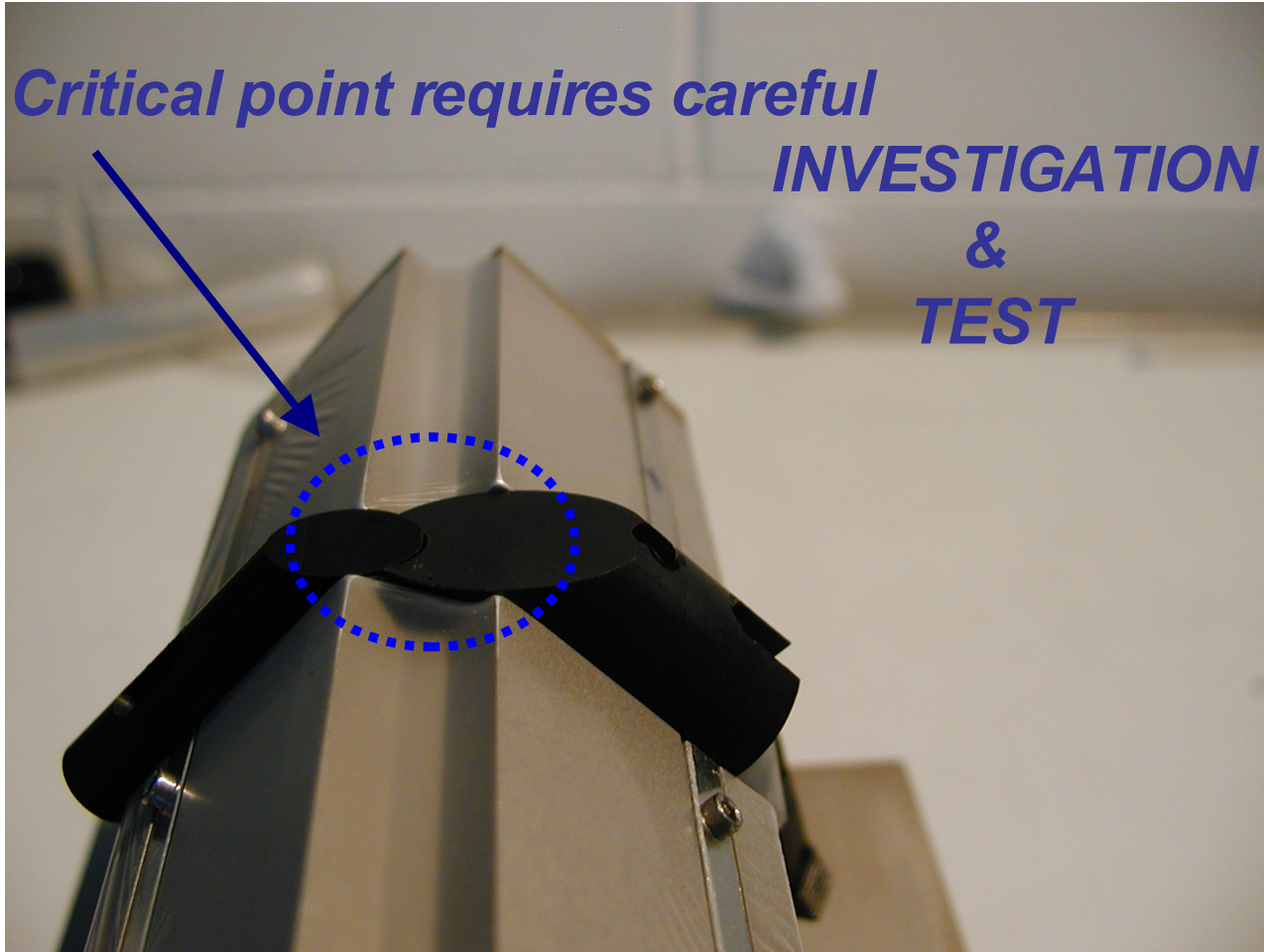
1 Test on Teflon shaping



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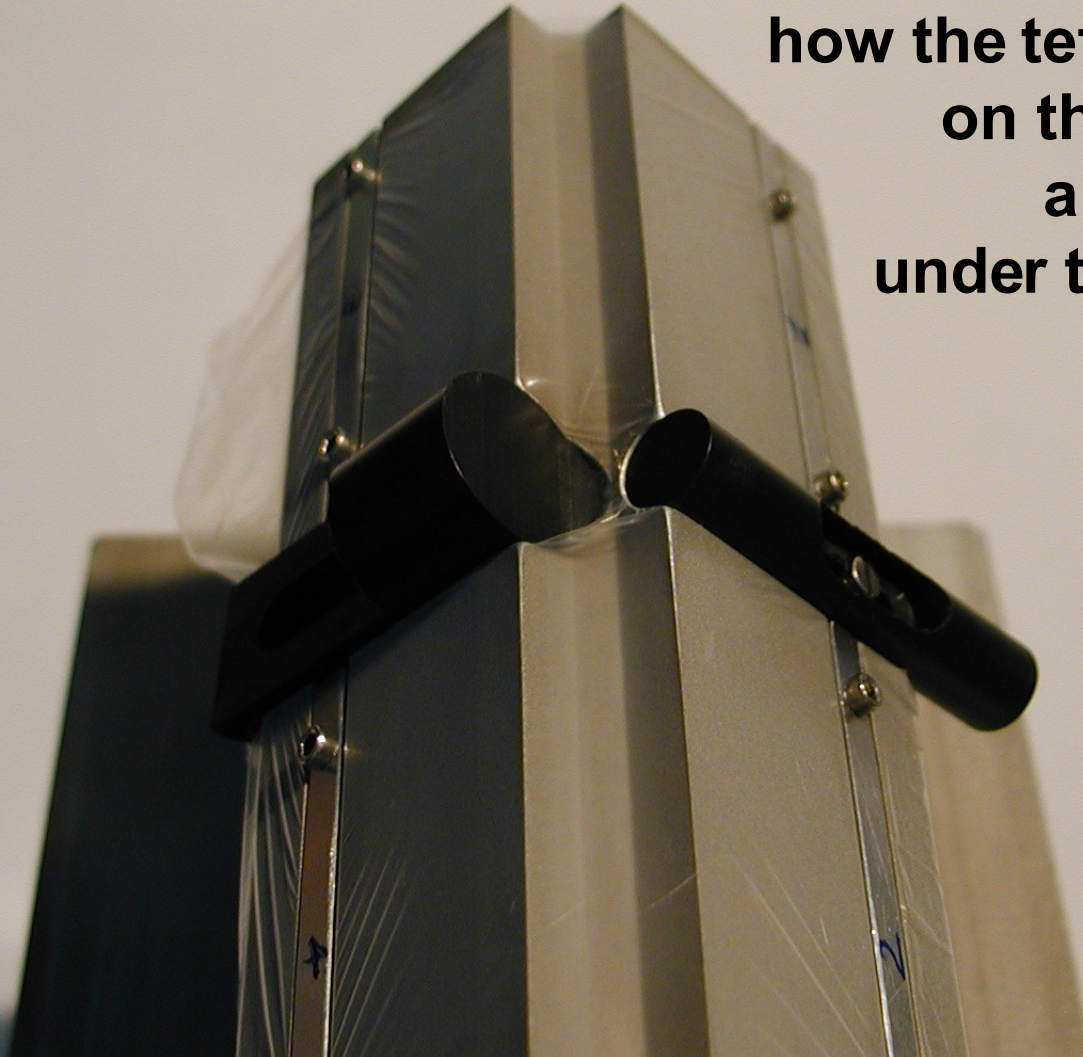
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1 Test on teflon shaping



2 Test: ...looking to shape.

**Tubes are shaped
in a such way to see
how the teflon wrap up
on the fins
and
under the tubes**



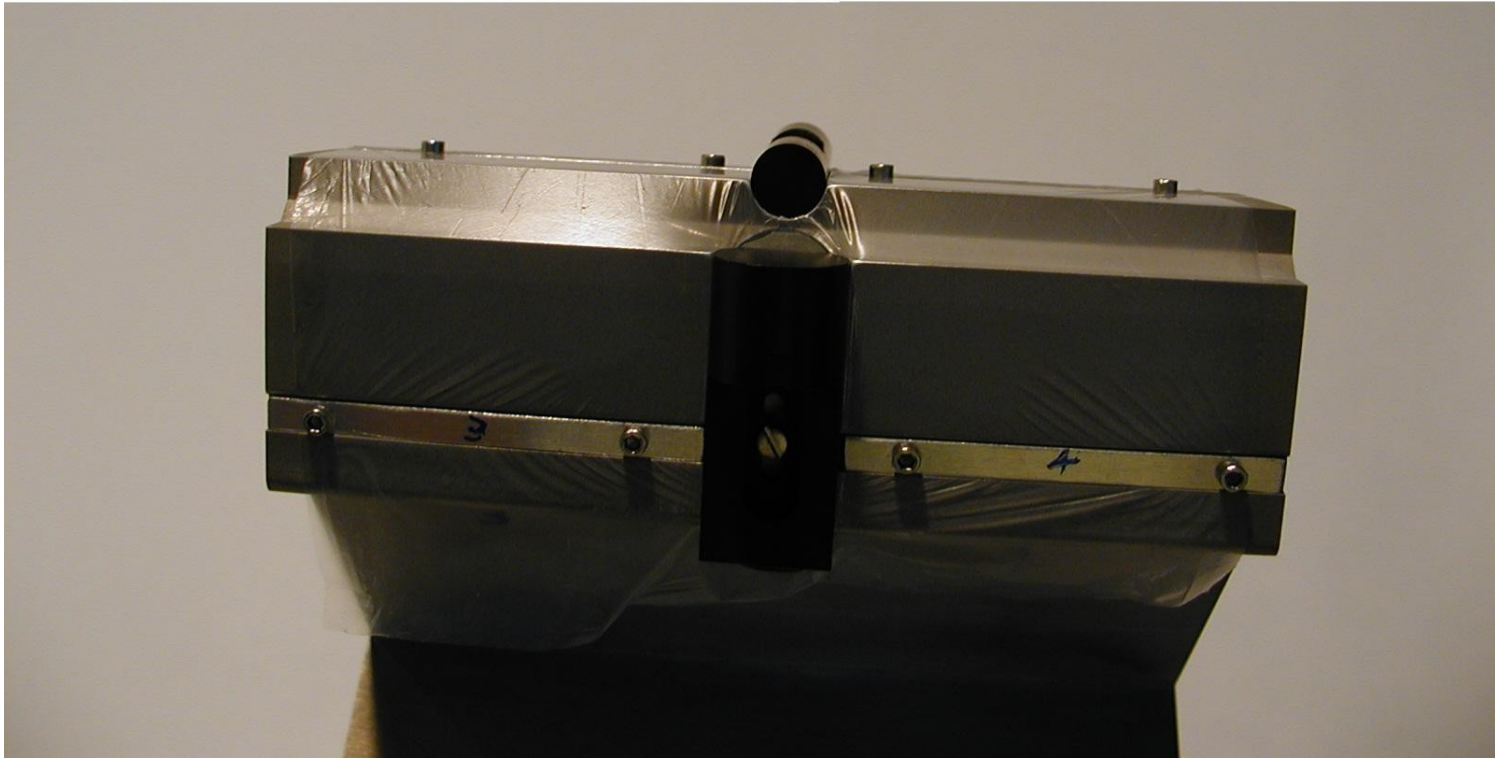
2 Test: ... looking to the shape



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2 test: ... looking to the shape.



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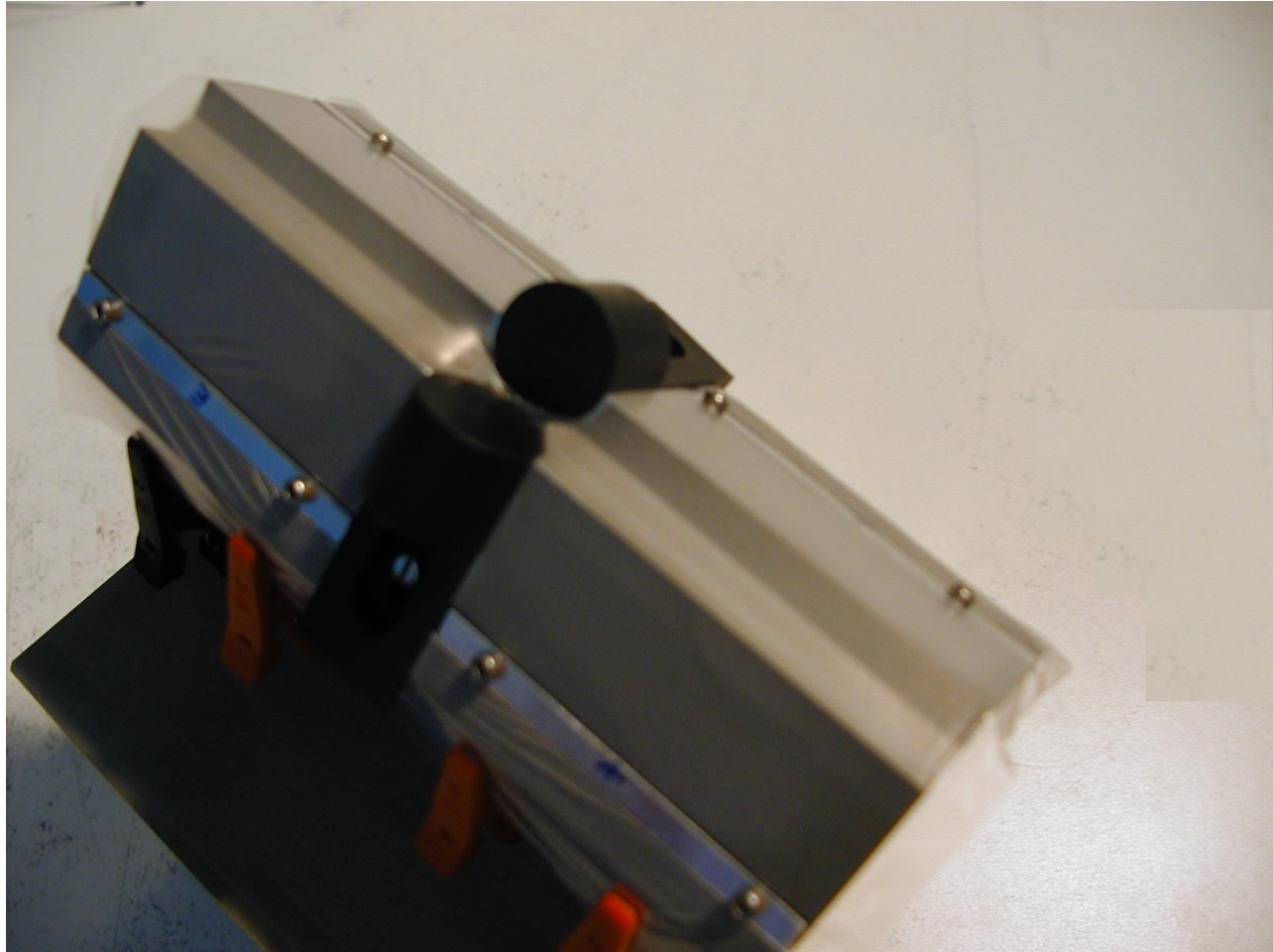
2 Test: ... looking to the shape.



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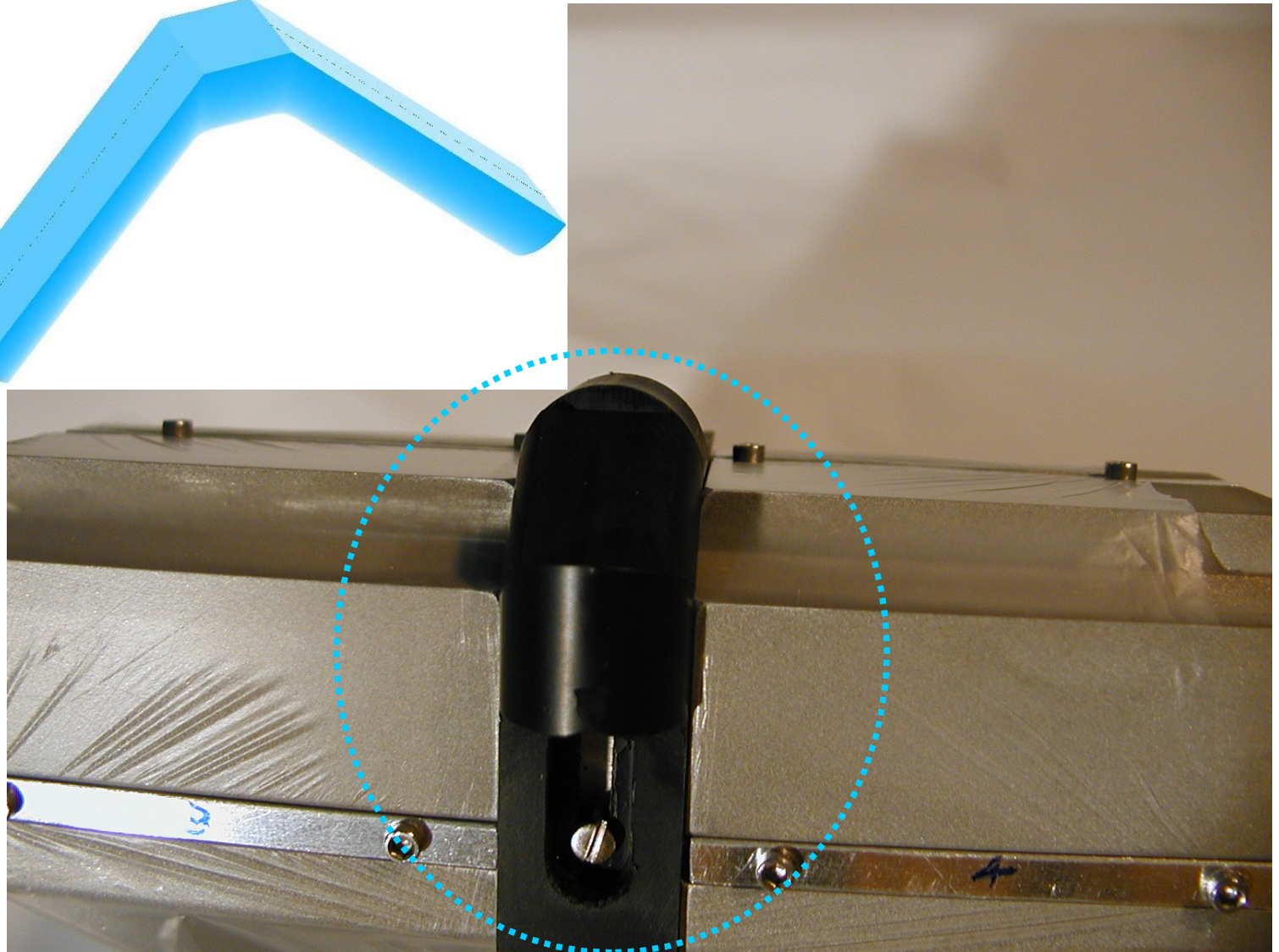
*3 test: teflon visible and
equal diameter site for both tubes*



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4 test: pushing teflon under a “saddle”

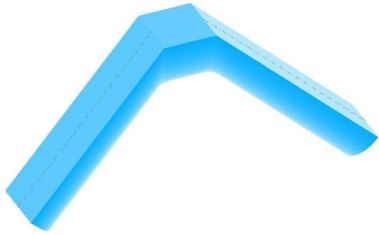


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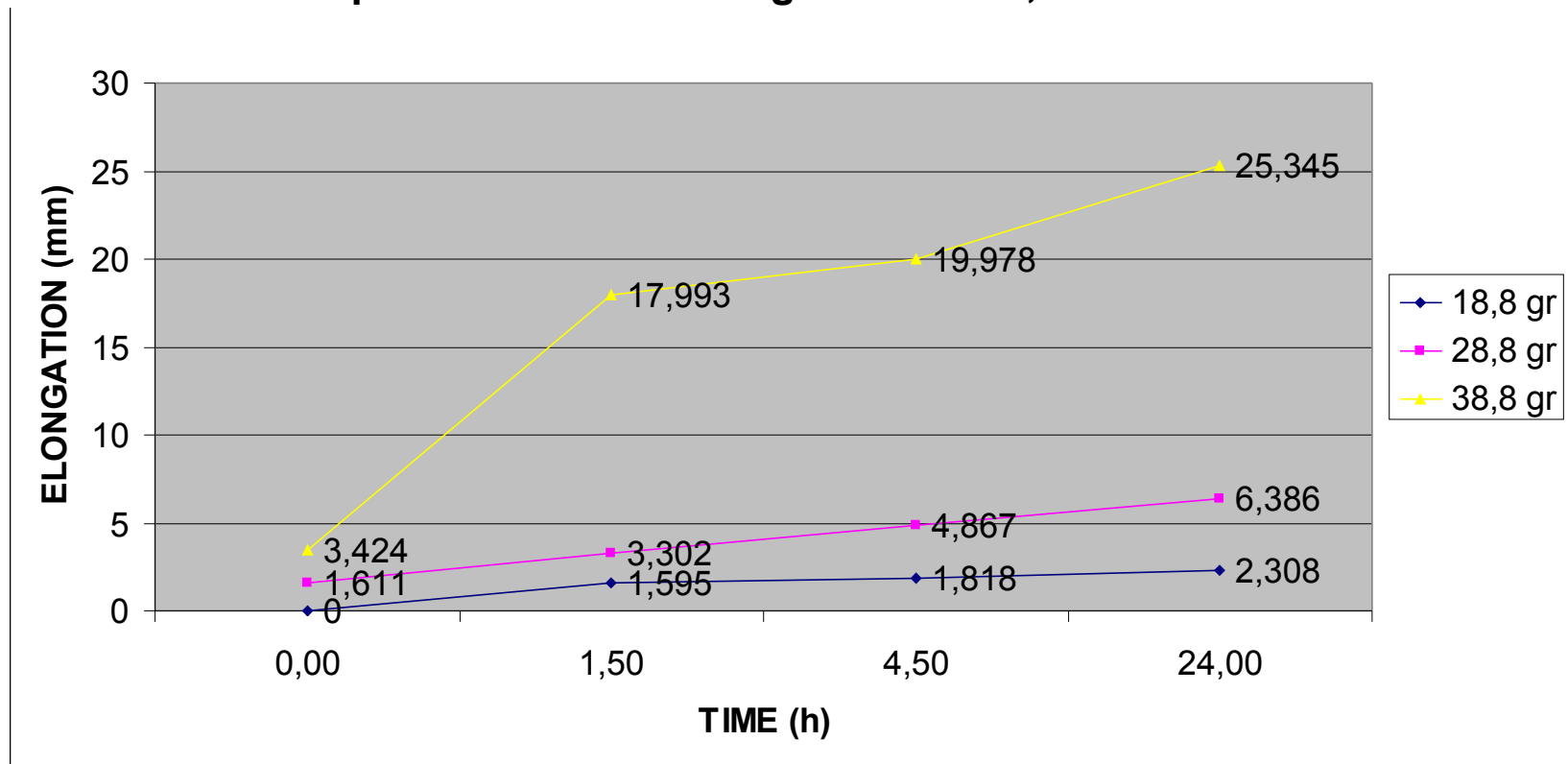
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Longer time with less force applied.

Base on the following



PTFE 0,005 mm - CREEP TEST
sample dimensions : length 100 mm ; width 10 mm



Few ideas: ... test will follow.

- **Directional Conductance for ABS Tube**
 - » Vane tube (fin tube)
- **Smaller Conductance**
 - » Longer tube
- **Smaller Conductance**
 - » Colder tube

Ideas to improve the target thickness

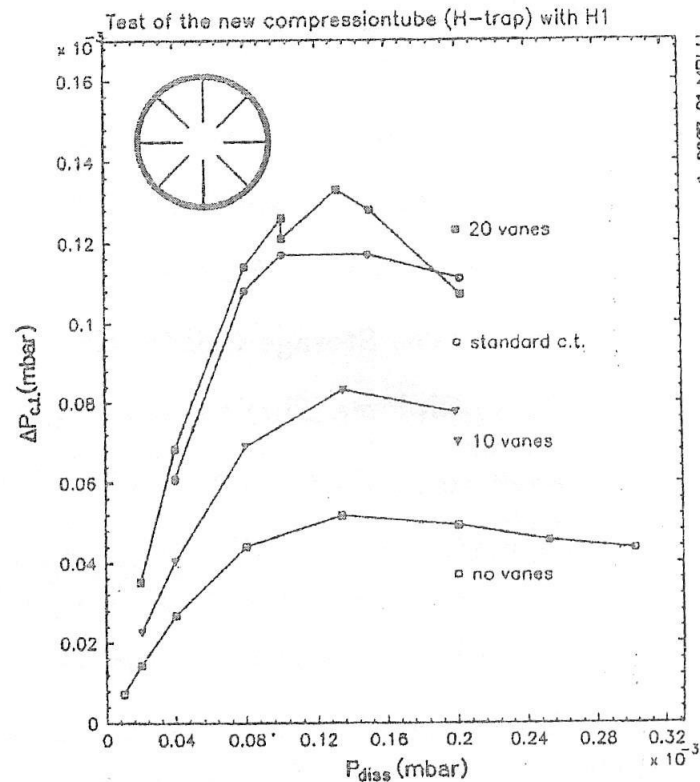
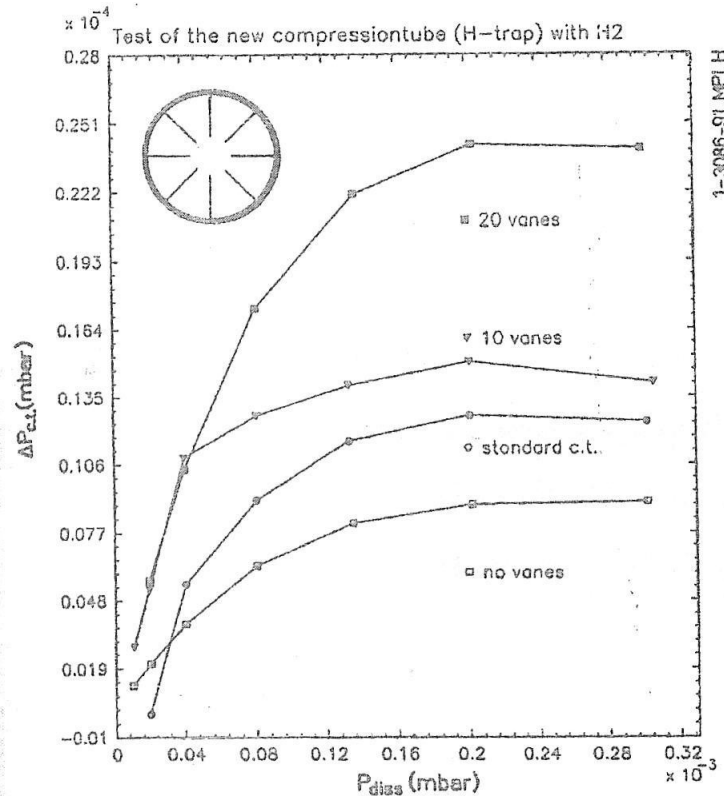


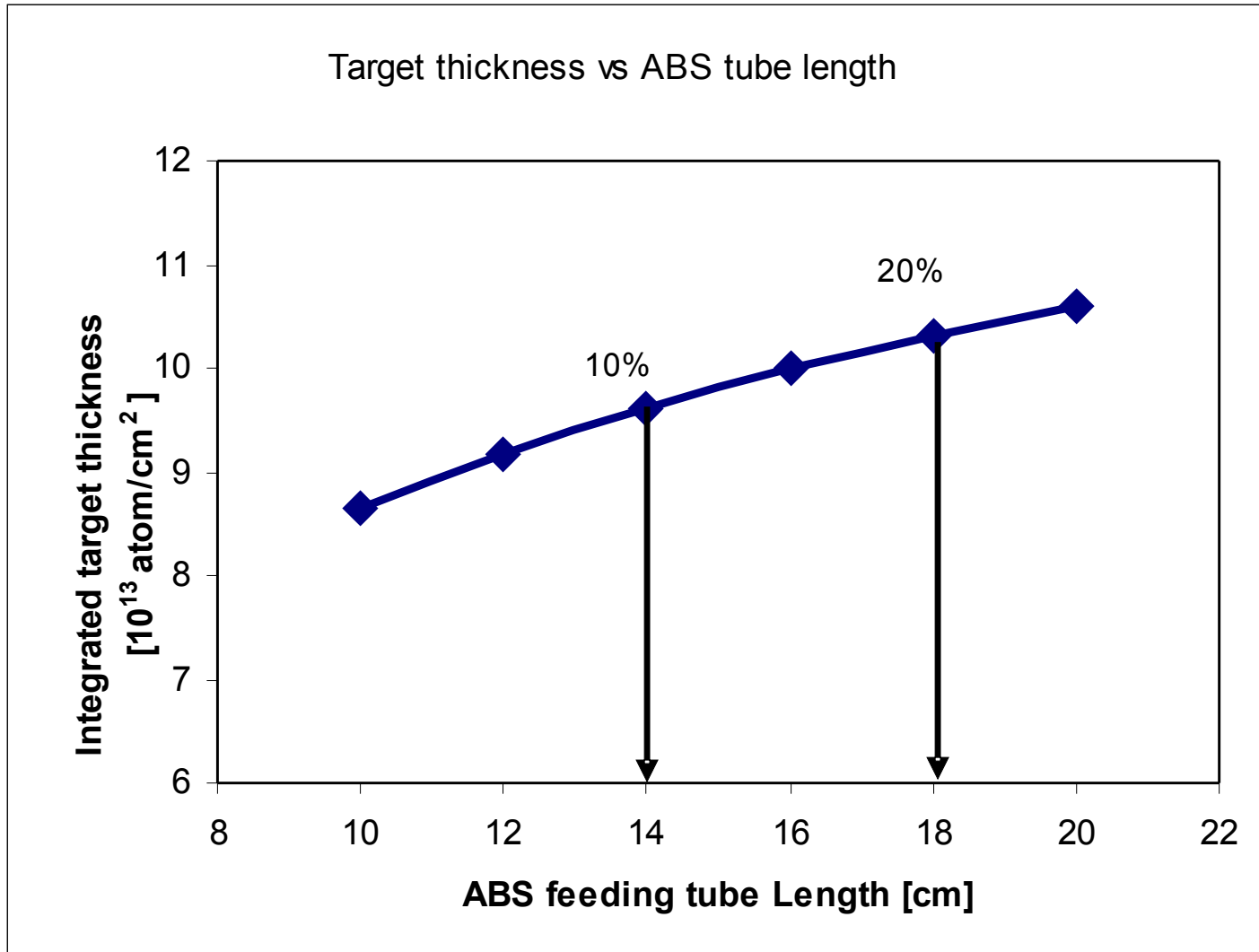
Figure 4: a. (left), b. (right). Pressure rise ΔP_{ct} in the compression tube for H₂ (left) and focussed H₁ (right) beam as function of P_{dis} (see fig. 2) for different compression tubes. All diameters 15 mm, except c.t. (10 mm).

Easy to installed in the designed cell

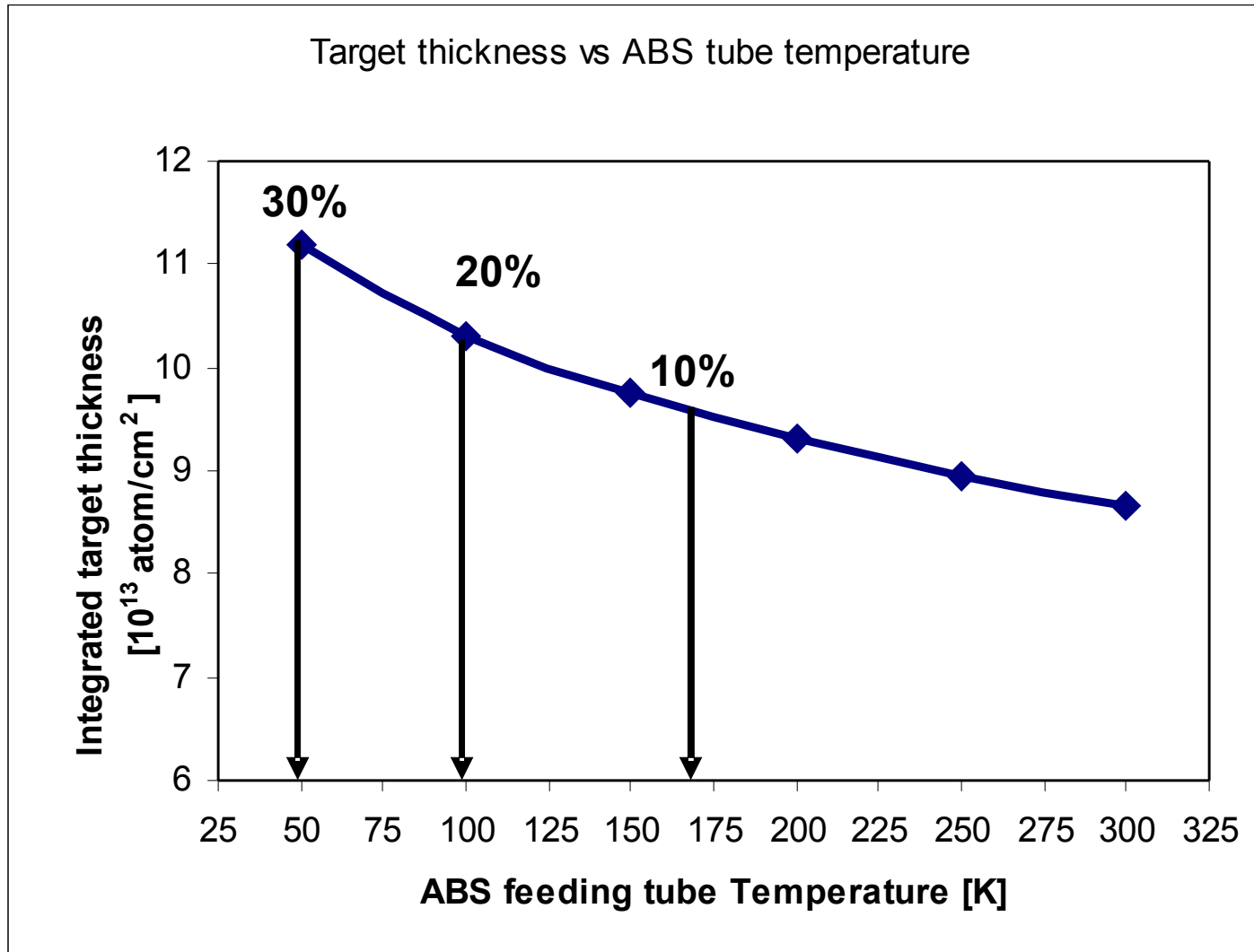
Ideas: directional conductance

- **Some tubes are already machined**
 - » (10mm x 100 mm 15 vanes)
 - » (10mm x 100 mm 10 vanes)
- MC Simulation (Michelle), taking into account the azimuthal velocity has to be supported by experimental data.
 - » Plan to measure the previous system in Ferrara (september-october).

ABS feeding tube length



ABS feeding tube cooling



Time plan

- **Prototype ready dec 2007 Ferrara**
 - Mechanical test (also under vacuum) december 2007
- **Target performance test (ABS-BRP Jülich)**
 - Polarization
 - Dissociation
- **Target thickness?**
 - Required?
 - » Calculation and measurement
 - » Agreed nicely for HERMES
 - » And IUCF – teflon foils and
 - » ANKE slit on a side
 - Only in line at COSY?!