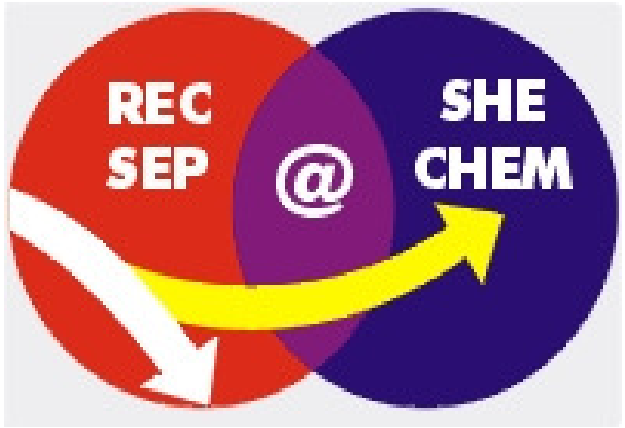
TASCA Target Group Status Report

K. Eberhardt for the TASCA Target Group

- New Target Station
- In-beam Performance of UF_4-Targets
- New Cell for Electrodeposition
- Outlook



Target Group Members

D. Ackermann, W. Brüchle, E. Jäger, B. Kindler, B. Lommel, M. Schädel, E. Schimpf

A. Semchenkov

A. Türler, A. Yakushev

H.-J. Maier, J. Szerypo

Berkeley Lab

K. Gregorich, R. Sudowe

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K. Eberhardt, J.V. Kratz, D. Liebe, P. Thörle

New members are always invited to join the group!

Target Group Meetings

Workshop on Recoil Separator for Superheavy Element Chemistry
March 20 - 21, 2002, GSI, Darmstadt, Germany

BGS / ChemSep Workshop
LBNL/Berkeley, November 21, 2003

3rd Workshop on Recoil Separator for Superheavy Element Chemistry
(TASCA 04): August 27, 2004, GSI, Darmstadt, Germany

Working groups started on specific tasks ⇒ TASCA Target Group:

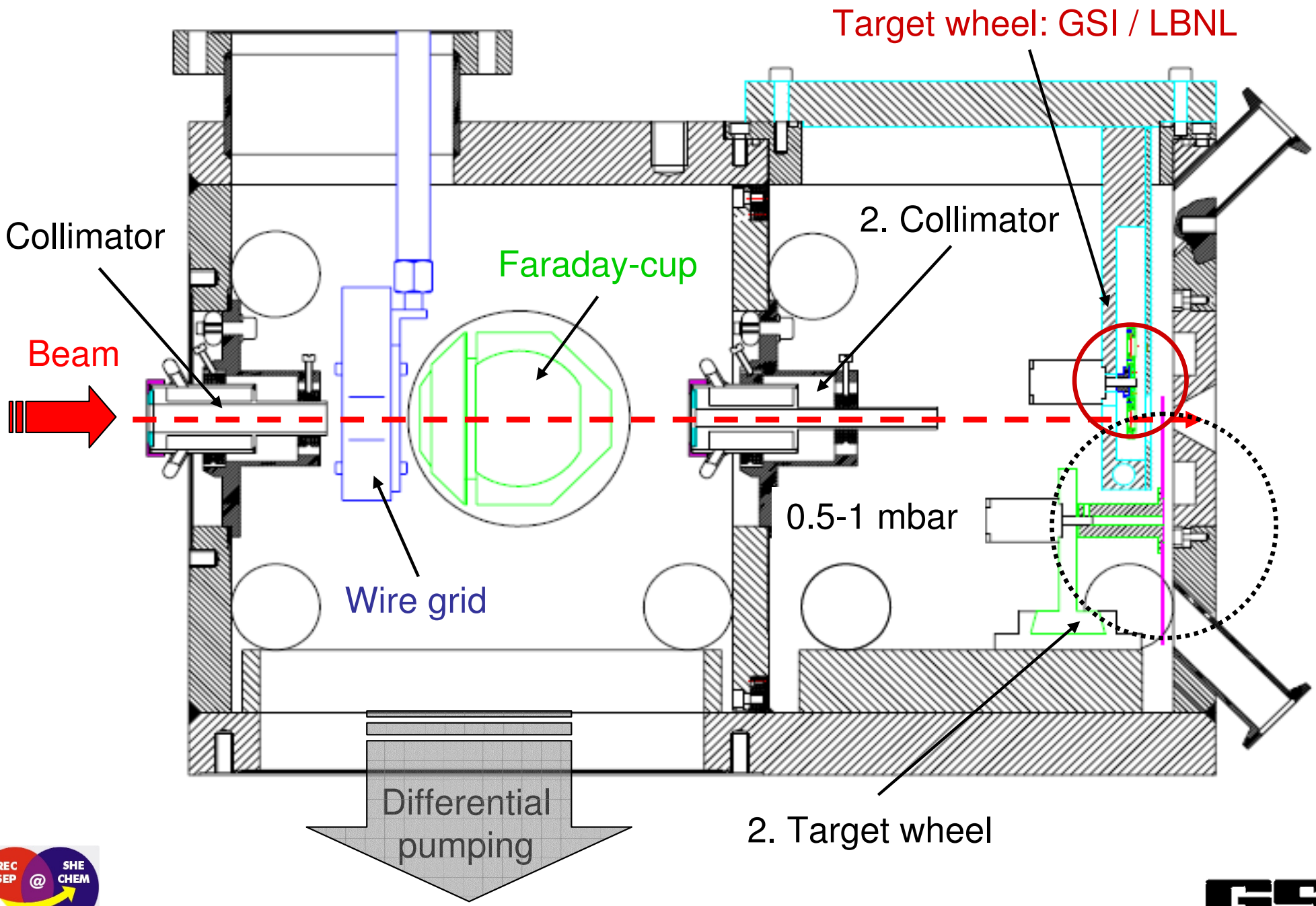
- Targets (preparation, rotation, safety, control, cooling),
- Window
- Collimator

Dec. 10, 2004:	1st TASCA Target Group Meeting
March 2, 2005:	2nd TASCA Target Group Meeting
July 20, 2005:	3rd TASCA Target Group Meeting

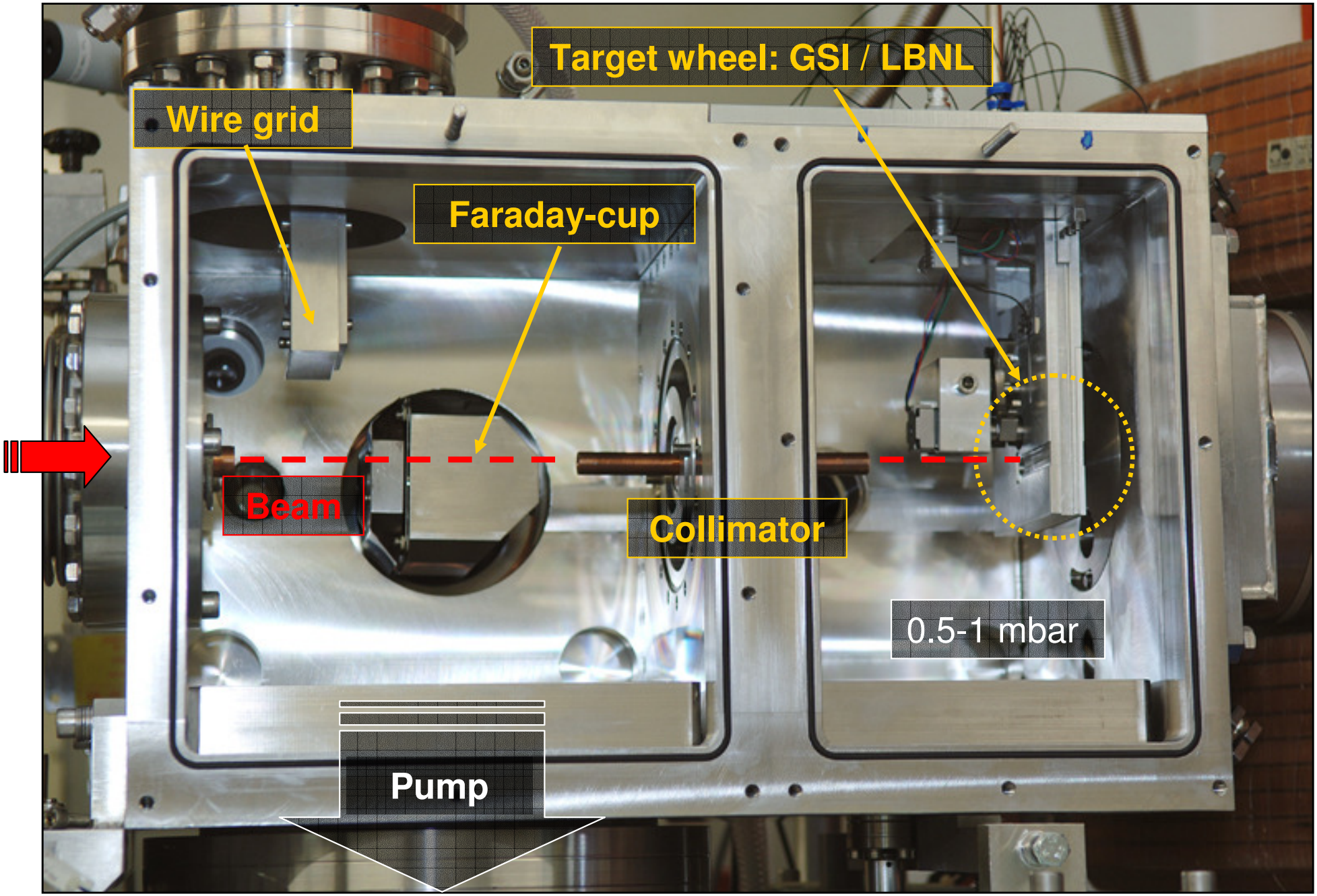
4th Workshop on Recoil Separator for Superheavy Element Chemistry
(TASCA05) October 6, 2005, Oslo, Norway

TASCA Target Group Meeting/TASCA Commissioning Kick-off Meeting
May 15th, 2006 @ GSI

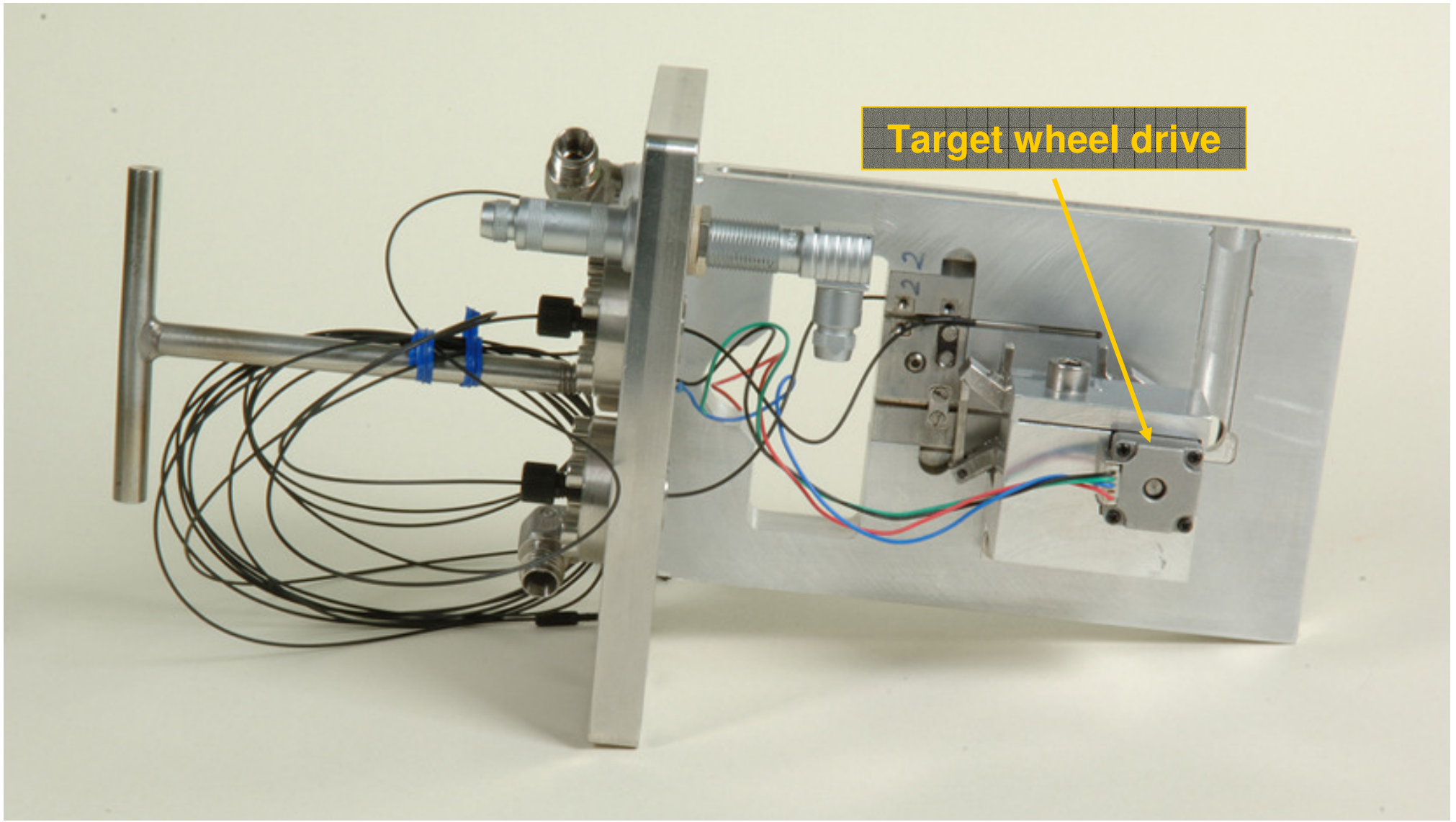
New Target Station for TASCA



New Target Station for TASCA



New Target Station for TASCA



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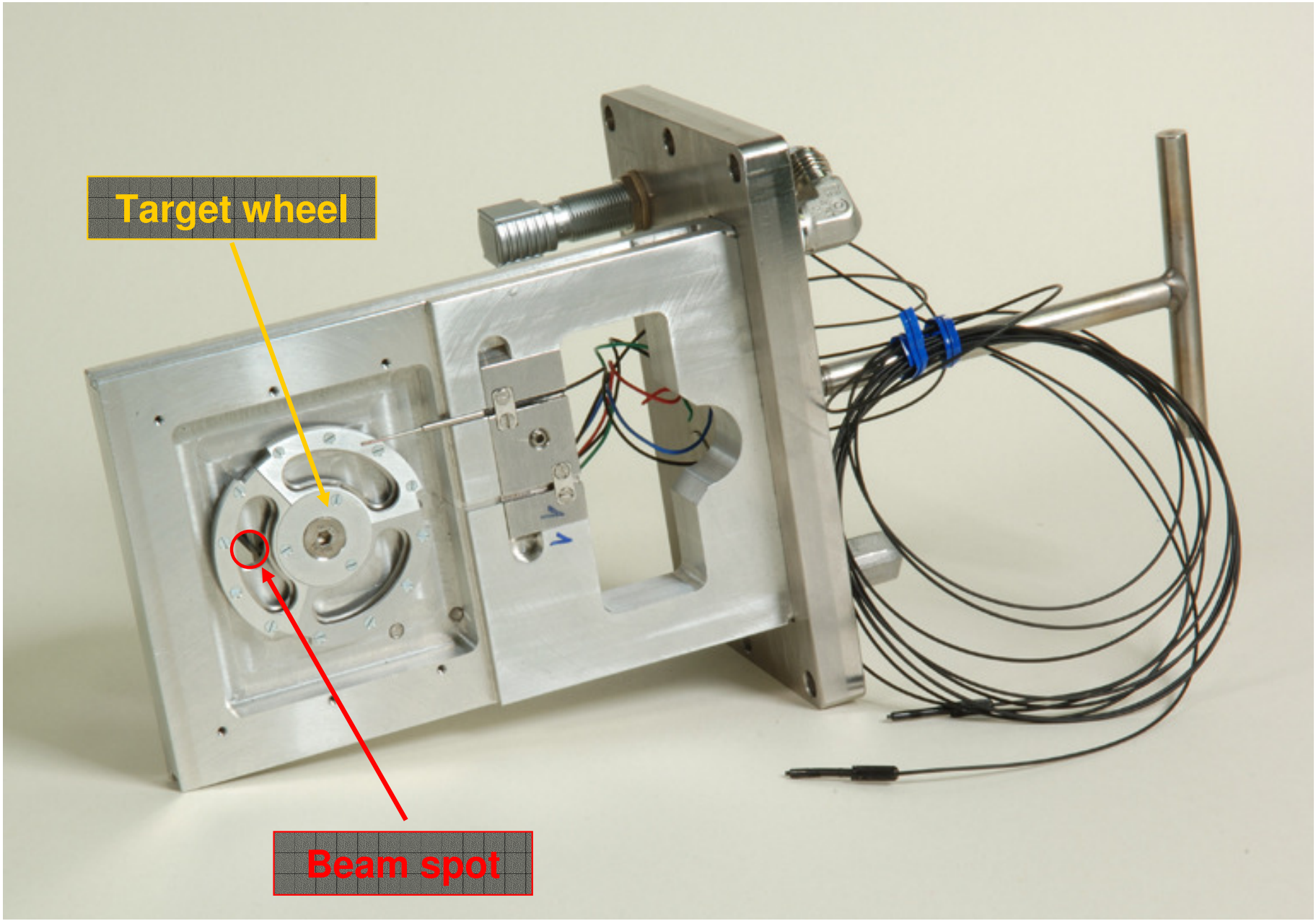
GSI

New Target Station for TASCA

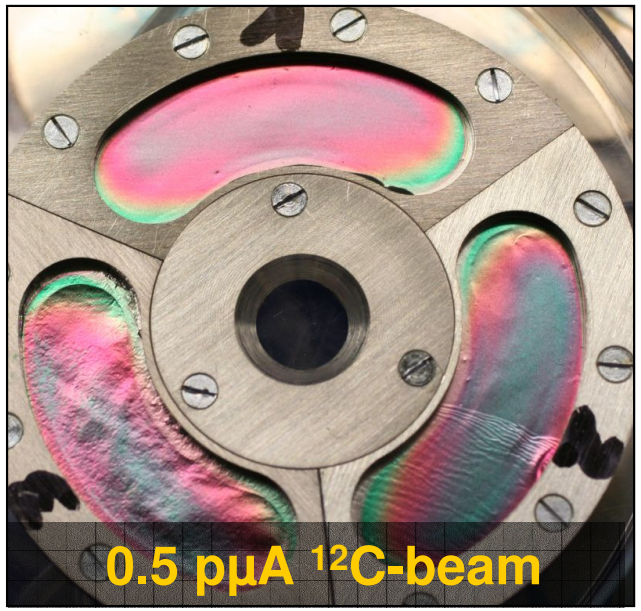


In-beam Performance of UF_4-Targets / ^{12}C-beam

- Frames out of AlMg3, thickness: 0.5 mm

- Cold rolled foils out of
  Al 2.25 µm, 4.6 µm, 6.4 µm, 10 µm
  (Goodfellow + WANIT)

• backing	+	thermal evaporation	+ covering layer
• Al	+	UF_4	+ C
• 2 - 10 µm		350 – 450 µg/cm²	+ ~ 10 µg/cm²
•		(according to U)	



→ Target performed well.
No damage, no holes

In-beam Performance of UF_4-Targets / ^{26}Mg-beam

- Cold rolled Al foils: different thicknesses and fabricates
- Cold rolled Al + evaporated UF_4 + C covering layer

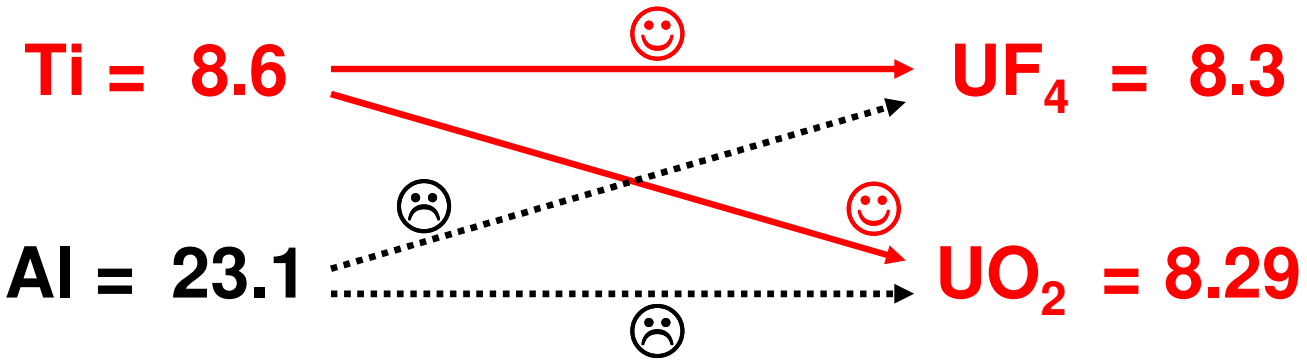
→ Target unstable in beam

→ Search for alternative backing materials

Thermal Expansion (TR) of Backing and Target Materials

Thermal expansion coefficient at room temperature given in [µm/(m·K)] = 10^{-6} [1/K]

Backing materials	Target materials
C = 7.1	U = 13.9
Ti = 8.6	UF_4 = 8.3
Al = 23.1	UO_2 = 8.29
	UC = 10.0



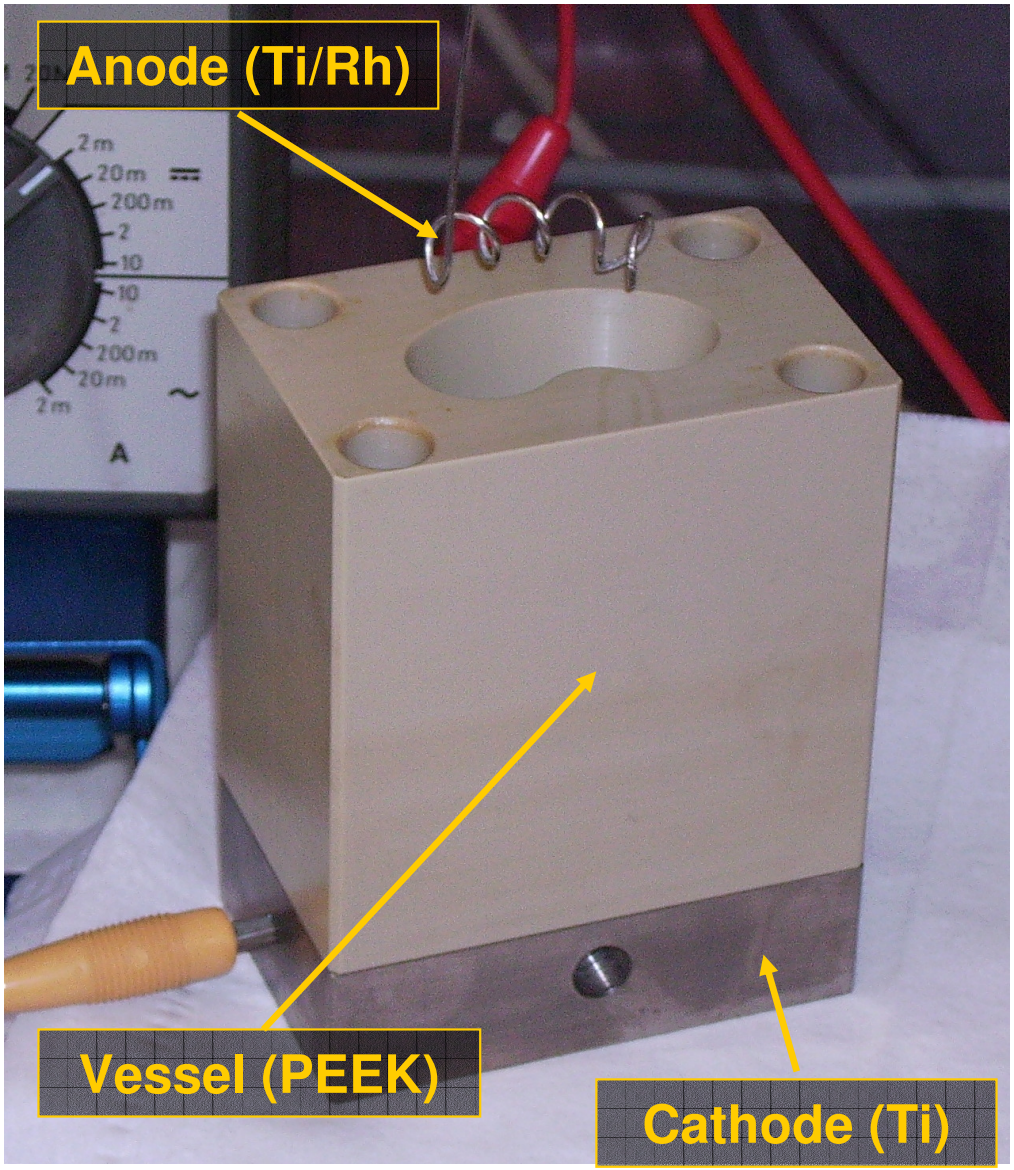
Handbook of Physics and Chemistry, 85th edition

Gmelin, Uranium compounds

Target Preparation by Electrodeposition (Molecular Plating)

Old Plating Cell

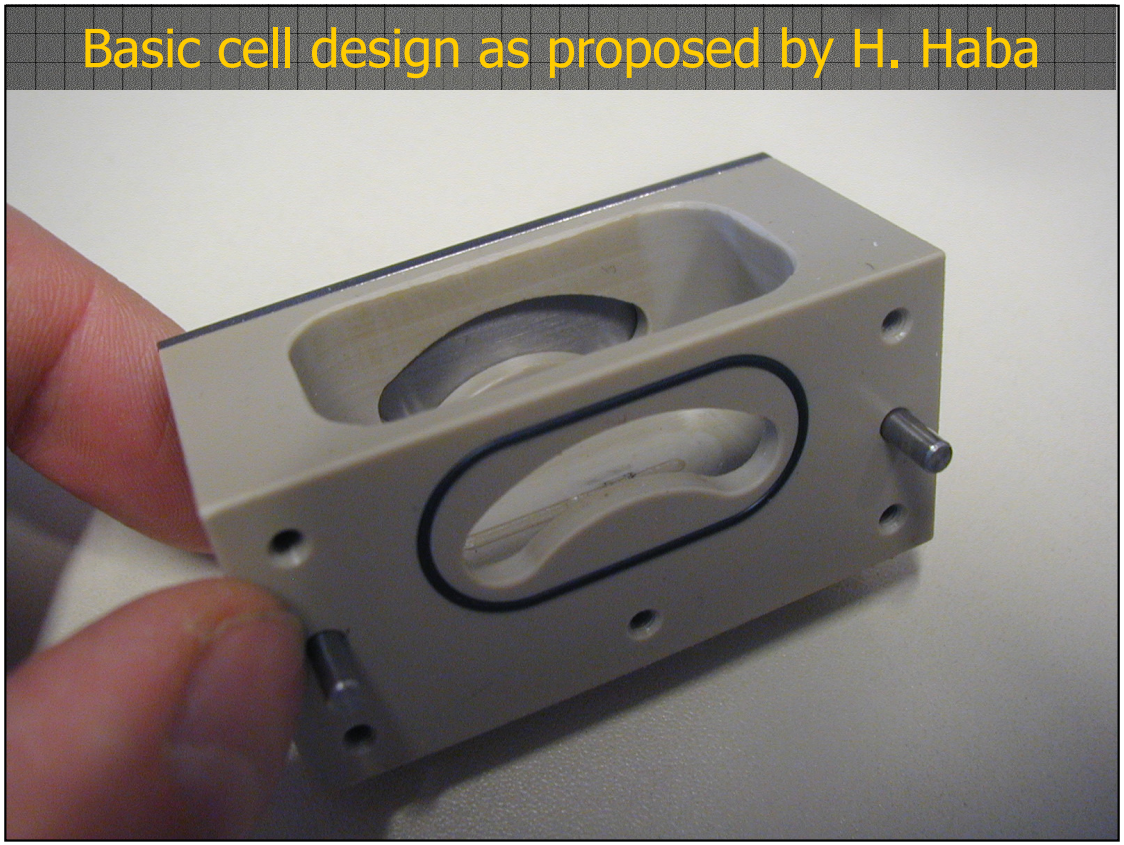
- Cathode: Ti-block, cooled in ice/water bath
- Anode: Coiled Pt (Rh) wire causes strong inhomogenity in electrical field
- Vessel: PEEK containing ca. 12 ml of organic solvent. No effective cooling of plating solution possible



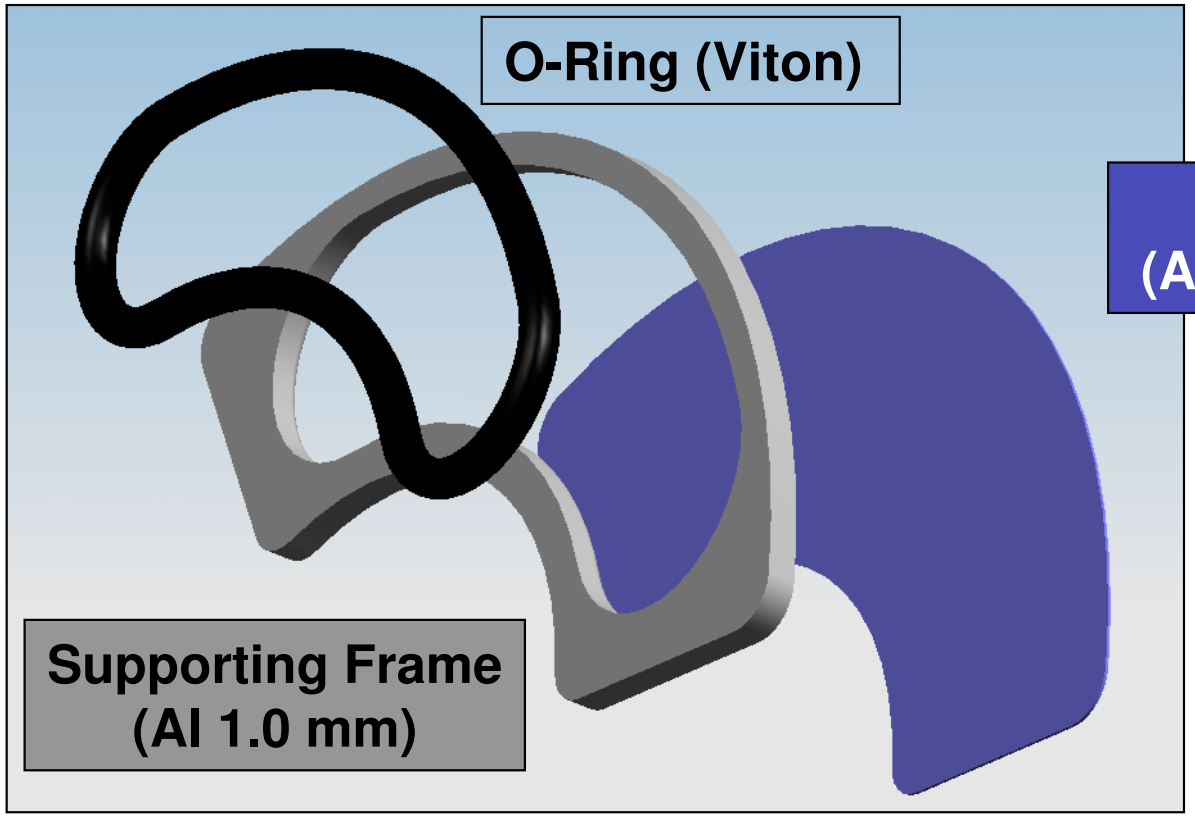
New Cell for Molecular Plating

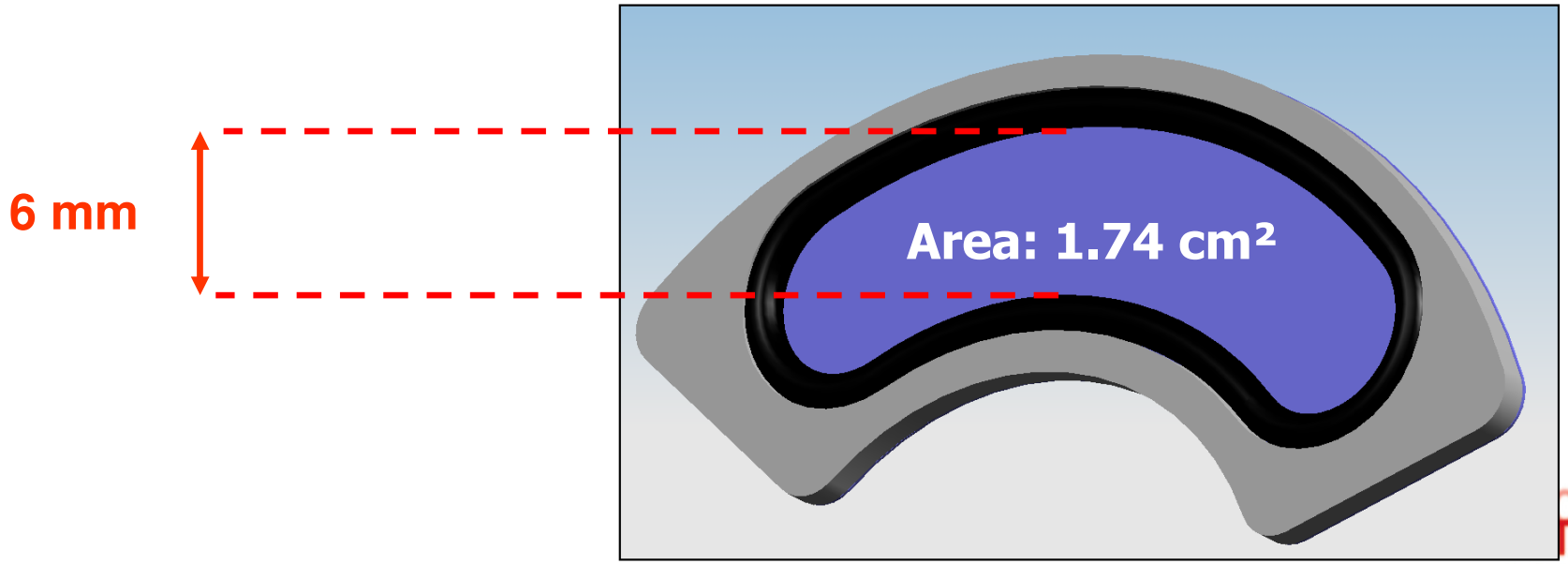
New Plating Cell

- Material: PEEK
- Volume: about 16 ml
- Anode geometry corresponds to cathode (target) geometry. Electrical field homogenious
- Stirring of solution during deposition possible
- Effective cooling and temperature control during deposition



New Cell for Molecular Plating





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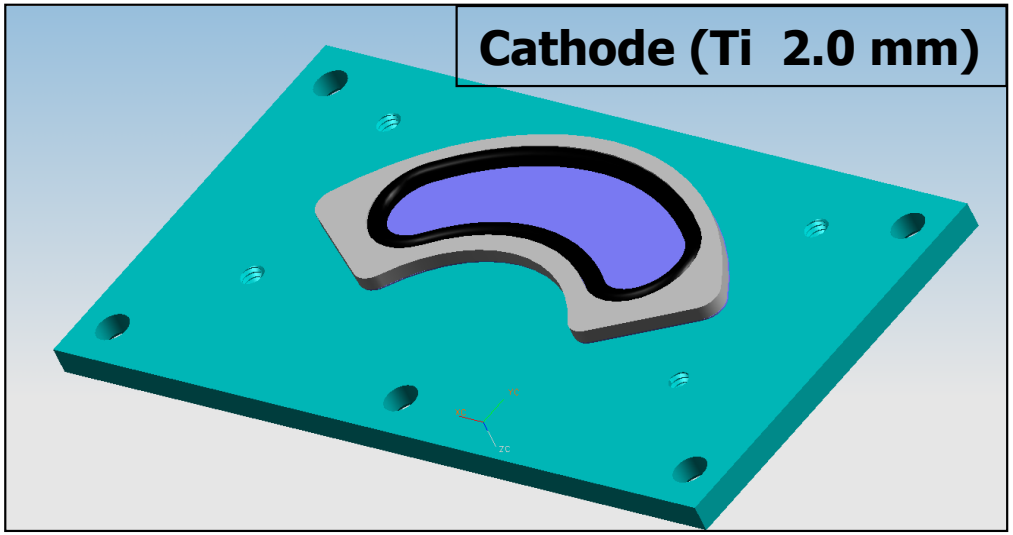
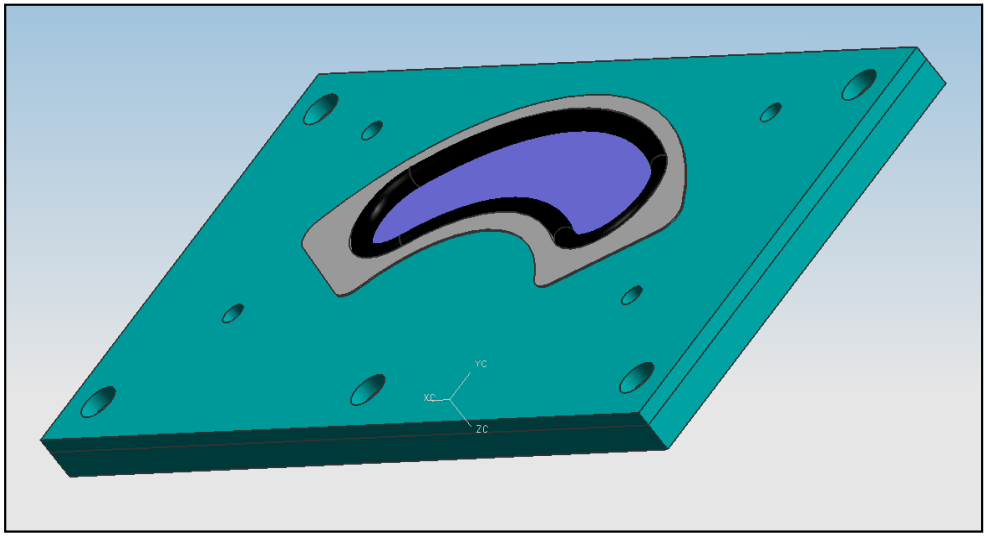
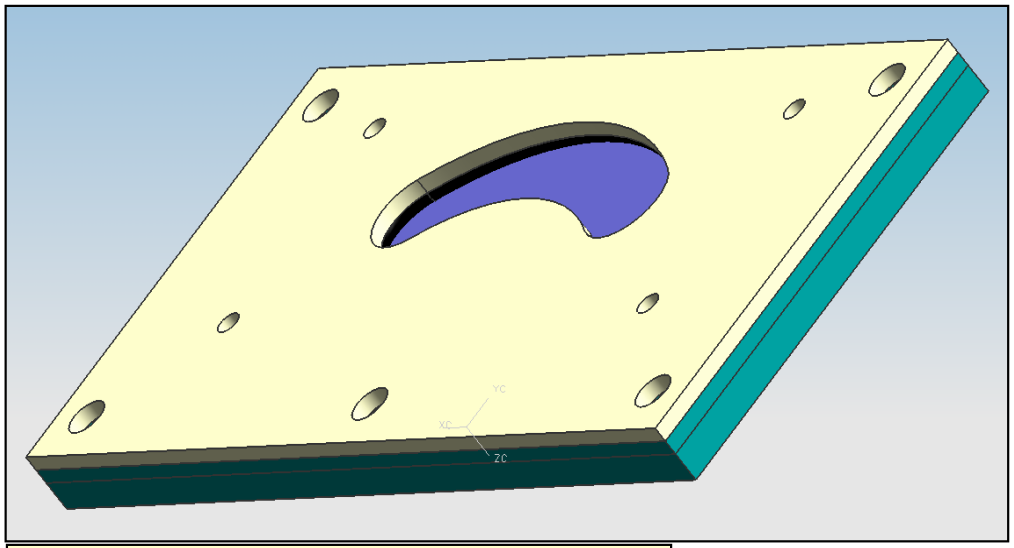
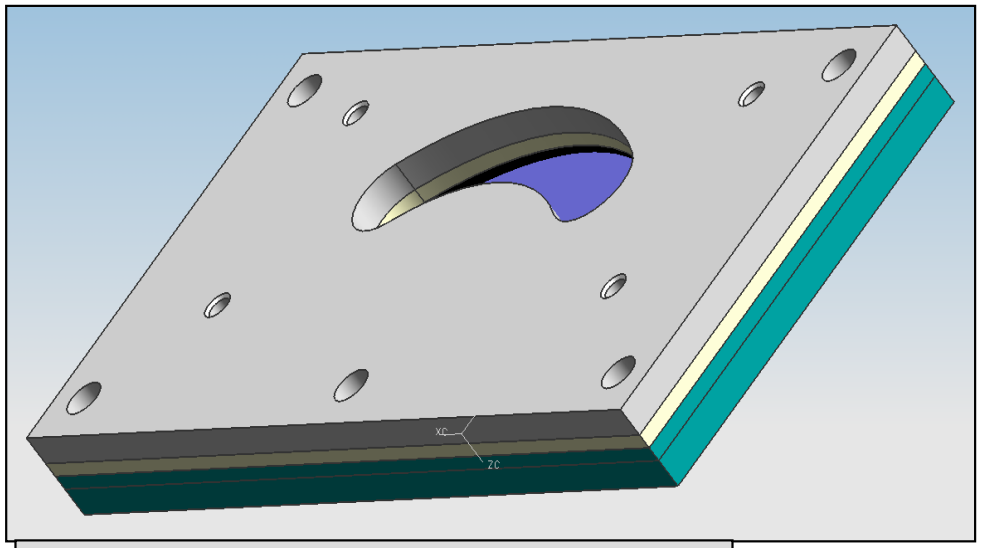






Silicon plate(1.0 mm)



Plexiglas plate (2.0 mm)

→ Easy and safe target handling

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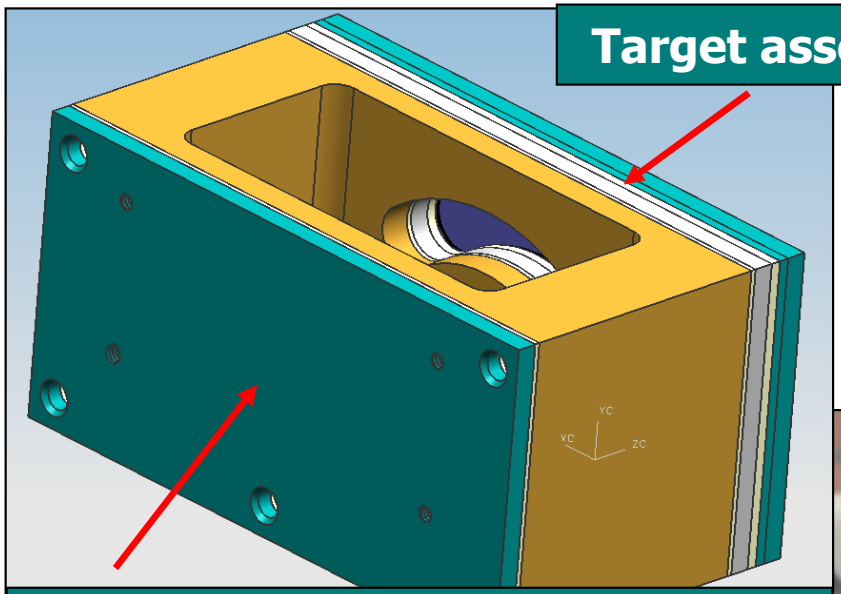
New Cell for Molecular Plating



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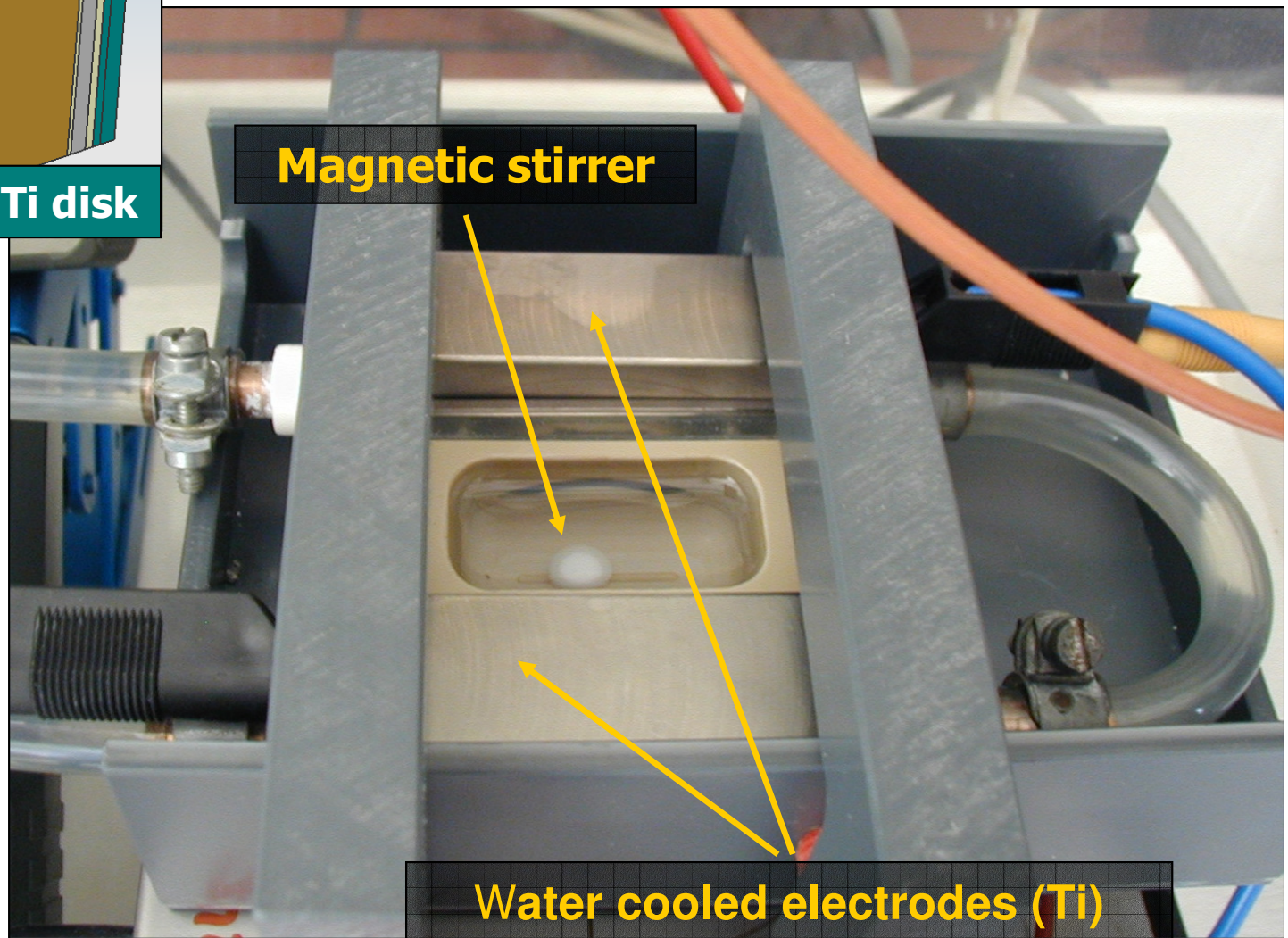

Cooling water

Cooling water

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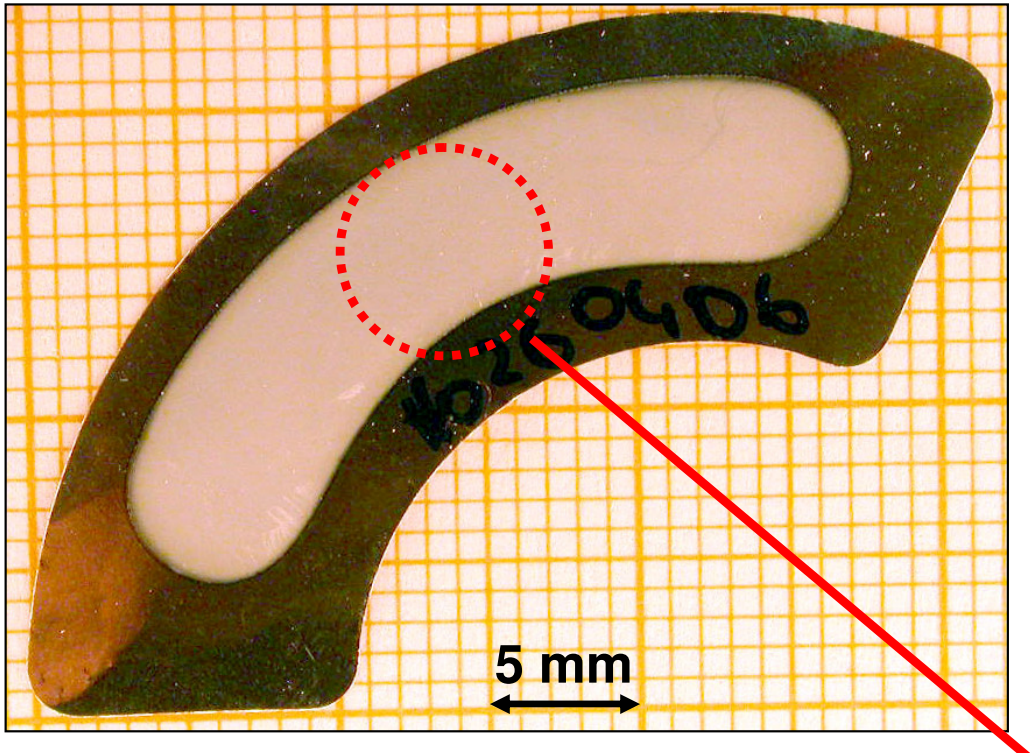
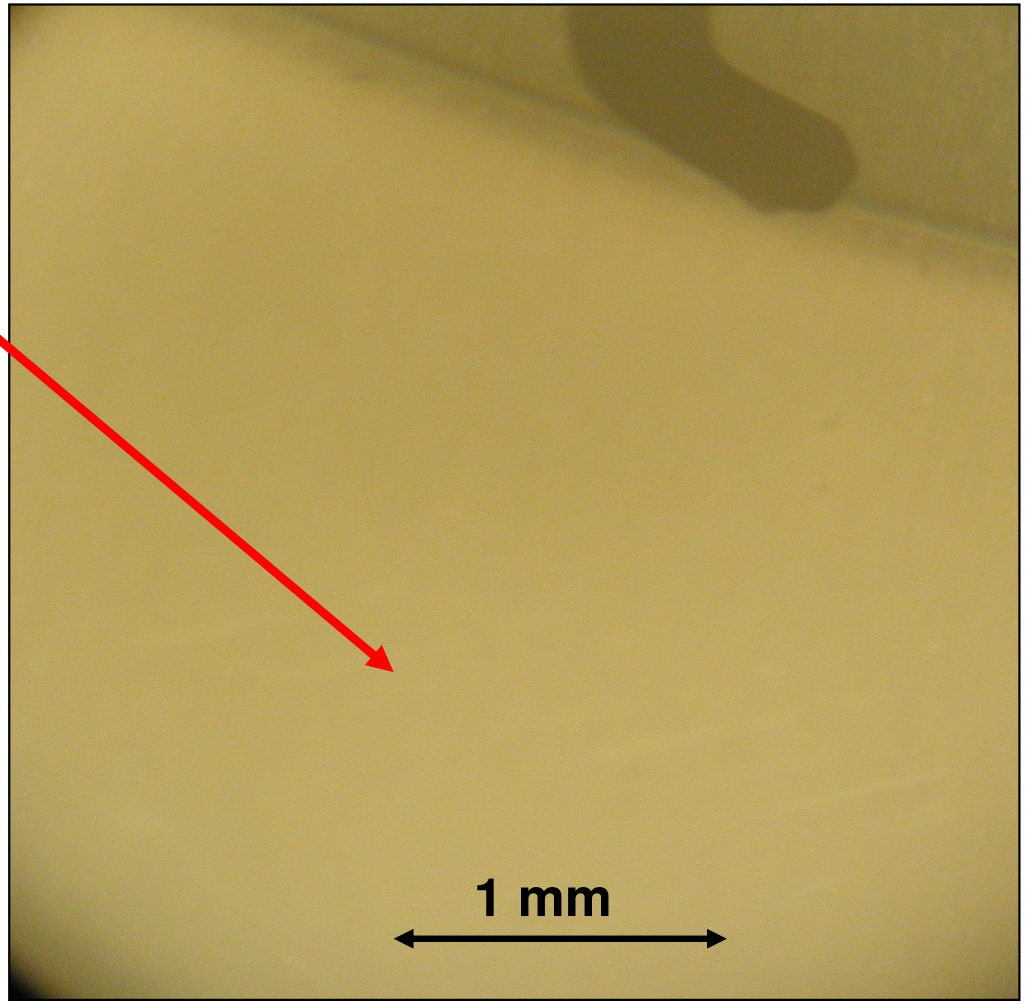
Ho- and Gd-targets for TASCA Commissioning



Ho (500 µg/cm²) on Ti (5 µm)



Plating solution: 1.0 mg Ho/Gd in 16 ml 2-butanol
Plating Voltage: 150 V
Plating time: 5 h
Temperature: 18 °C
Target Area: 1.74 cm²
Deposition Yield: > 90 %
Target Thickness: > 500 µg/cm²

⇒ **9 targets (4x Ho and 5x Gd)**

Outlook

Isotopic analysis of the actinide compounds used for target production by means of ICP-MS

Optimize plating conditions for Th, U, Pu, Cm + Lanthanides. Imaging of U- and Th-targets before and after irradiation using autoradiography and TEM (at GSI)

Test and optimization of rotating target station for TASCA/BGS

Production of thin Al backing foils. Preparation of U/UF_4 targets (Al- /Ti- / C-backings). Test of in-beam target performance

U/Th-Oxide targets on different backings including carbon as backing material.