

EMPIR 18RPT03 MetForTC

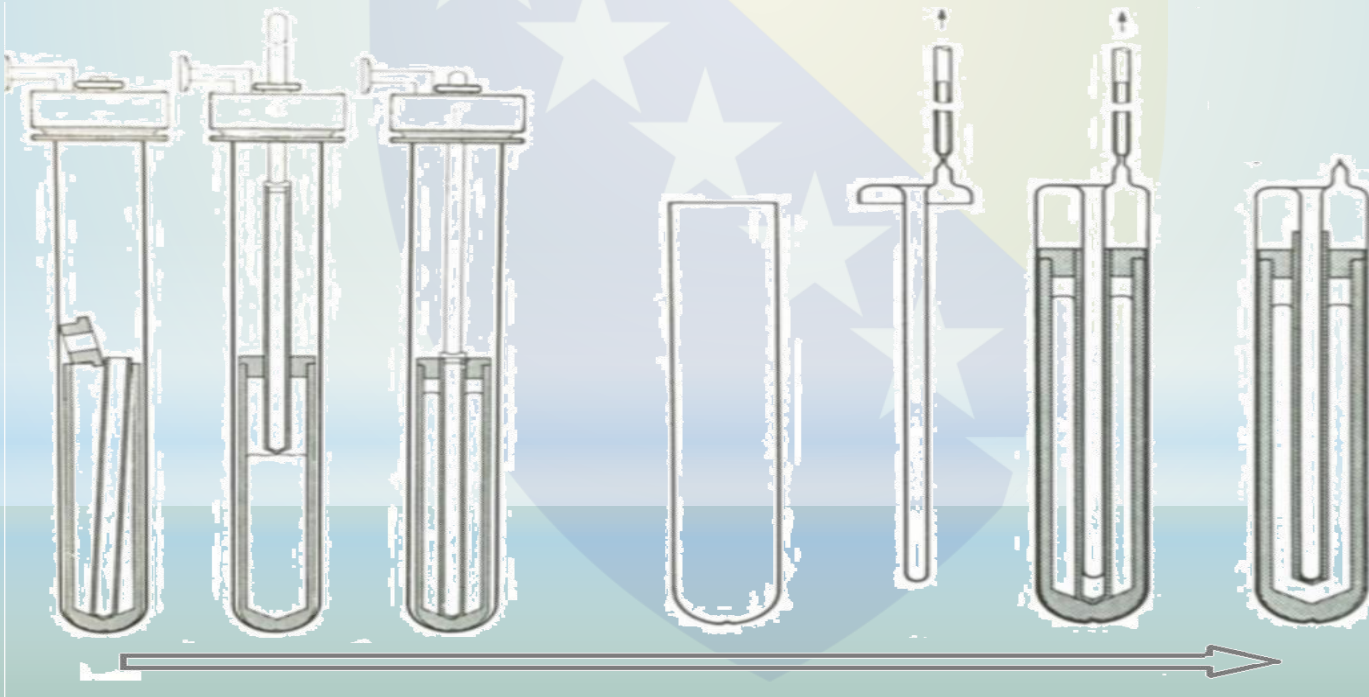
18RPT03-RMG1

*Researcher in design of temperature
fixed-point cells*

- *EMPIR - The European Metrology Programme for Innovation and Research (EMPIR)*
- *Call for Researcher Mobility Grants (RMG)*
https://msu.euramet.org/capacity_building/index.html
- *The aim of RMGs is to increase the capability of the European metrology researcher community; increase the capacity of individual researchers in metrology*
- *MetForTC RMG Schedule → 18RPT03-RMG1*
- *RMG Duration → 3 months during 2021*

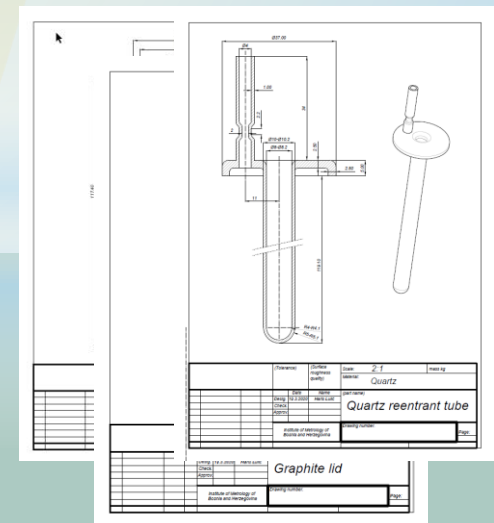
RMG1 activities :

- In addition to cells developed in the project – development of miniature silver FP cell (961,78°C)*
- Work on design and construction of miniature silver fixed point cell*
- Validation/calibration of the produced cell*

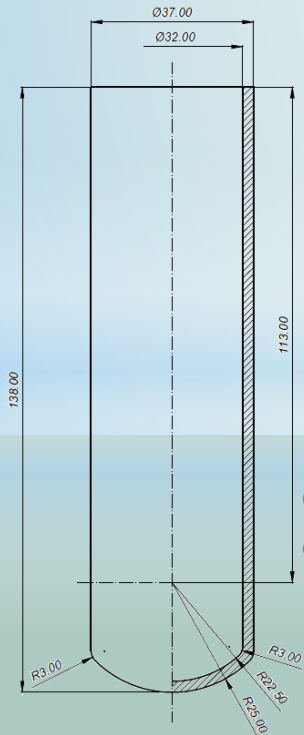


Design and development of the miniature silver fixed point cell (AgFP)

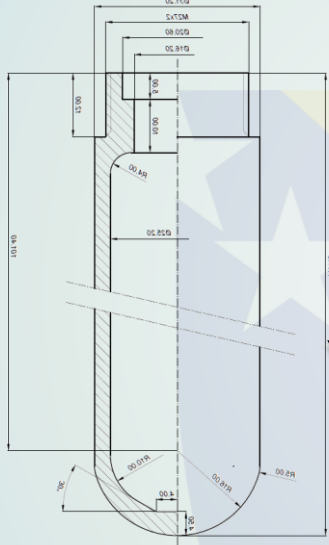
- The aim of this task was to gain an understanding of the principles and the design of miniature FP cells which were developed in WP2 of the parent JRP 18RPT03 MetForTC
- focus was to adopt a design that was compatible with IMBiH existing equipment, to use the miniature AgFP cell in the OBERON 426, Isotech furnace
- Created design based on review of available designs from EMPIR Eurathermal project, of ISOTECH cells and in collaboration with TUBITAK and FSB



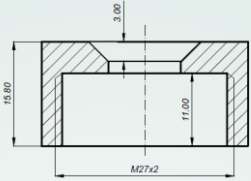
Parts of high purity Graphite (5ppm) inside the Quartz glass.



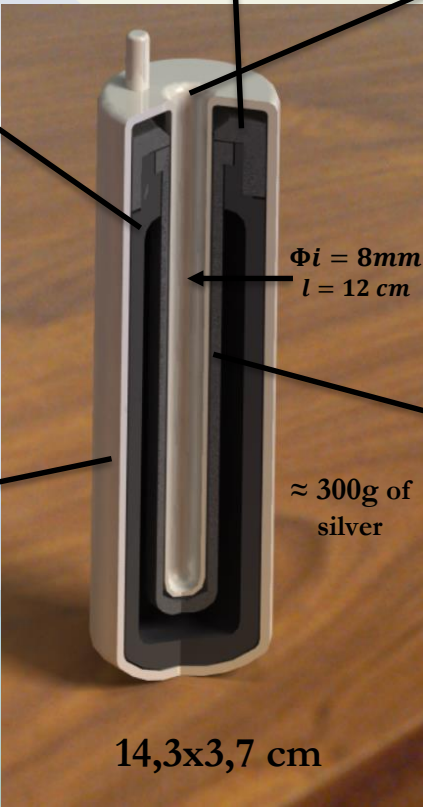
Quartz crucible



Graphite crucible



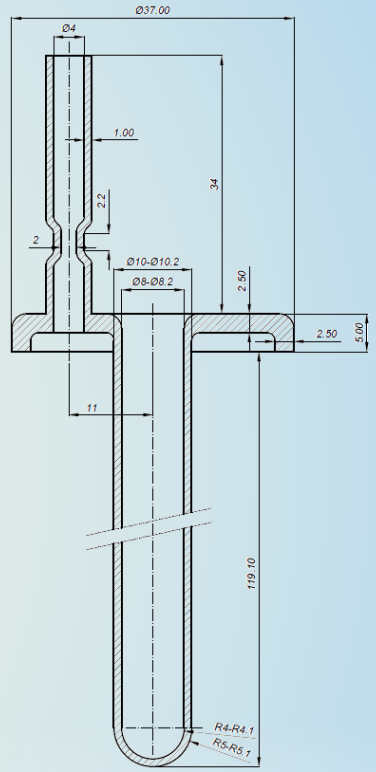
Graphite lid



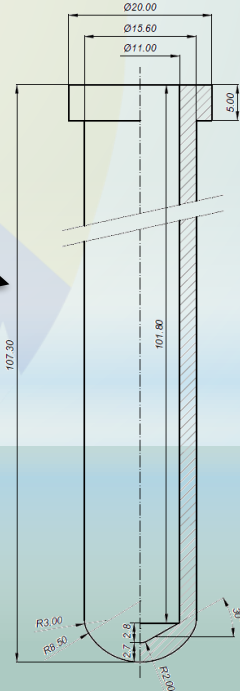
$\Phi_i = 8\text{mm}$
 $l = 12\text{cm}$

$\approx 300\text{g}$ of silver

14,3x3,7 cm



Quartz reentrant tube



Graphite reentrant tube

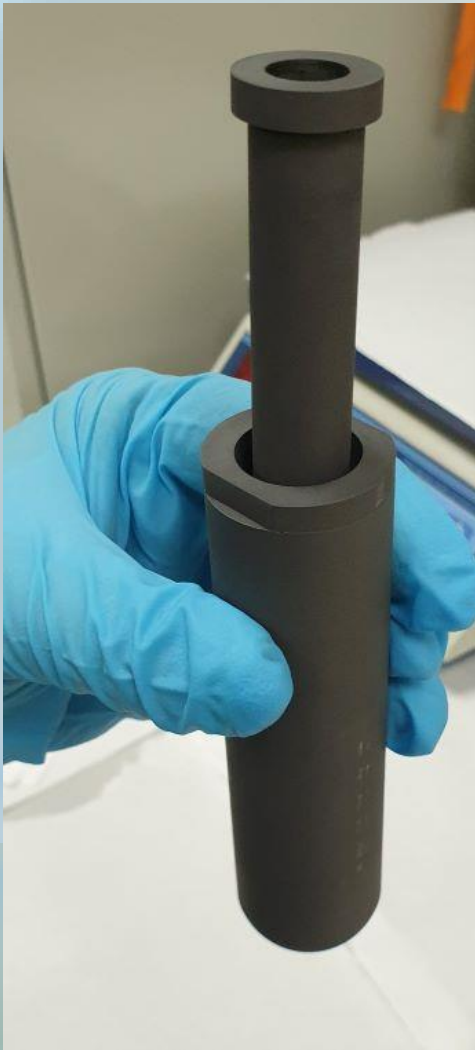
Render of designed parts



Quartz parts produced – 2 sets



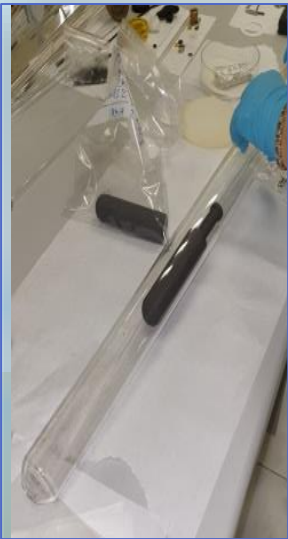
Graphite parts produced – 2 sets



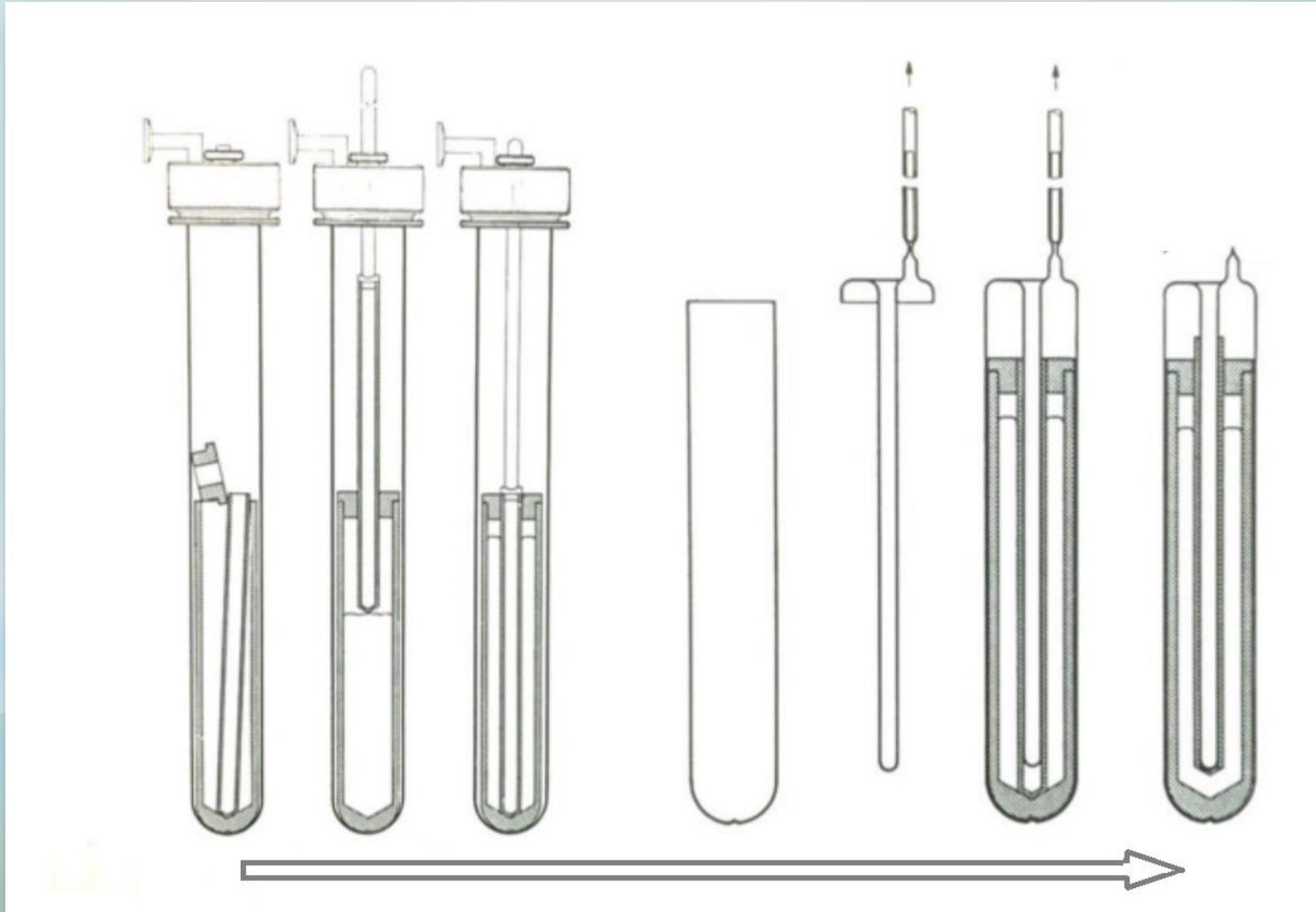
- ✓ *high purity metal of silver (6N; 200,6 g and 5N; 189,2 g)*
- ✓ *the silver samples were supplied from Johnson Matthey Co. (6N silver) i Strem Chemicals, Inc. (5N) silver*

Construction of silver fixed point cells

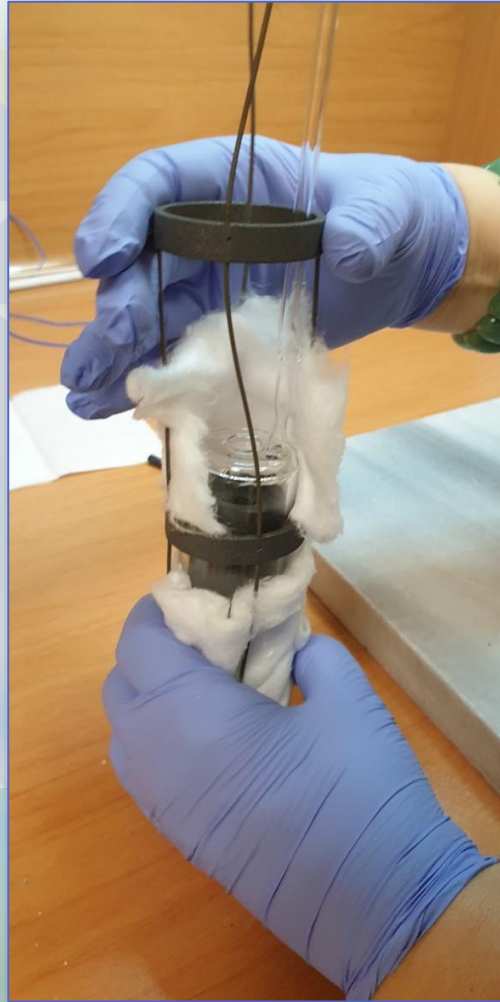
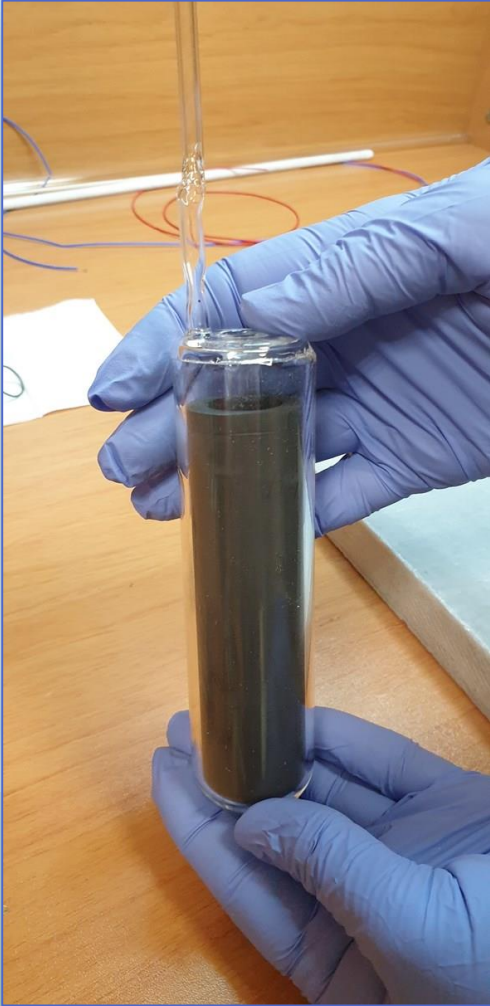
- *Construction of the fixed-point cell consisted of several phases and several parts, all the steps were performed at TUBITAK following their usual procedure for construction of fixed point cells*
- *The system for construction of fixed points cell mainly consists of a vacuum pump, cold trap, three zone furnace and argon gas line with pipes and valves*



Construction of silver fixed point cells



Silver fixed point cells AgFP (6N,5N)-constructed



Silver fixed point cells AgFP (6N,5N)



Realization of AgFP



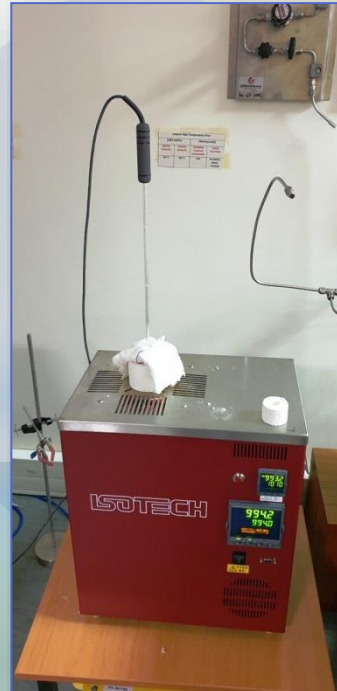
Small AgFP6N



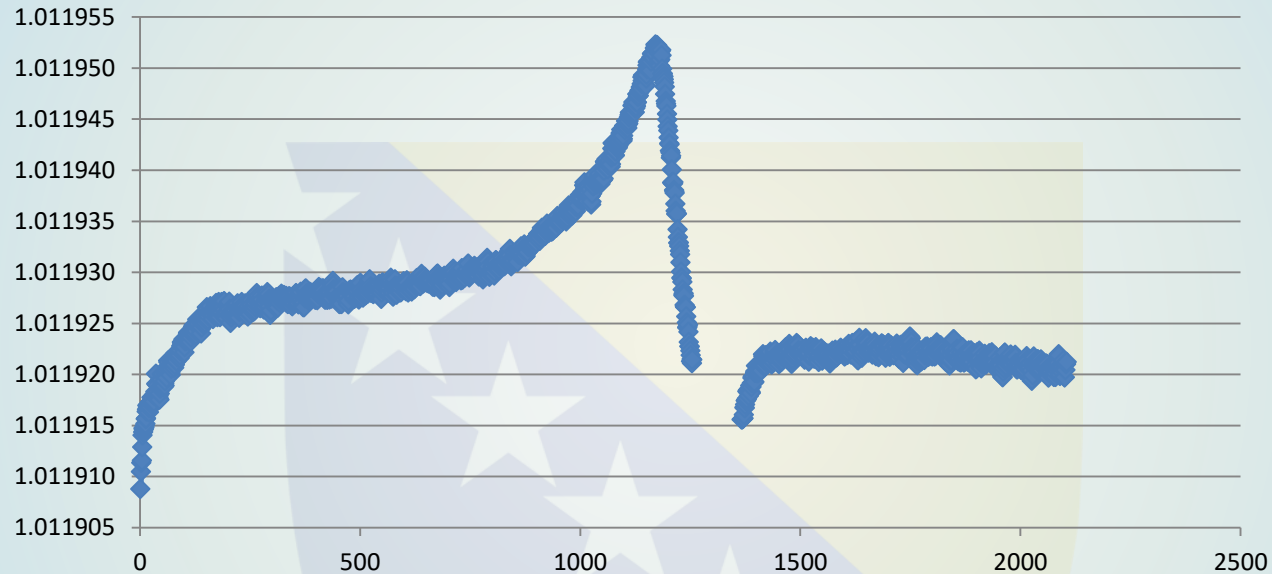
Small AgFP5N

Validation of the developed silver fixed point cell AgFP

- Realization of 6N and 5N AgFP cells in Isotech Oberon 426 furnace (450°C - 1090°C)
- Determining the furnace setpoints for AgFP cells (melt and freeze)
- full melt and freeze plateaus were realized
- Measurements were done with :
Pt/Pd TCs i HTSPRT (0,25 Ohm, Hart scientific 5684)
- compared with TUBITAK AgFP standard cell (Ag 189)



Results

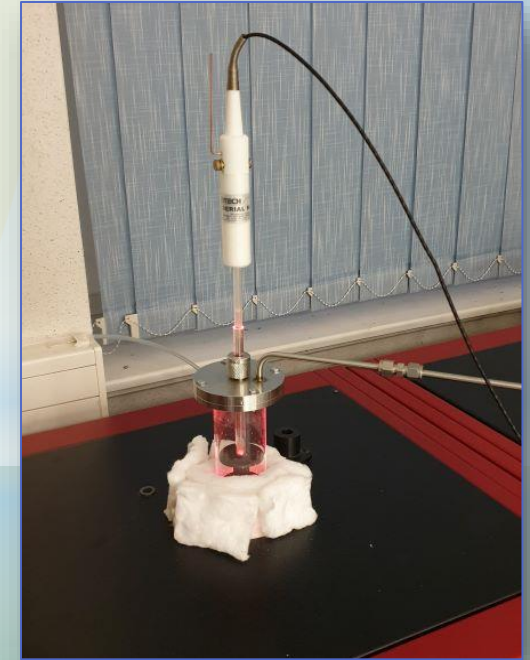


Melting and Freezing plateau with the new Ag1FP

- *The comparison results showed the temperature difference, mean value of 2,6 mK*
- *The comparison uncertainty was estimated to be 5 mK*
- *Freezing plateaus lasting almost 3 h*

➤ planned activities at LT IMBiH:

- Realization of 6N i 5N AgFP cells in Oberon 426 furnace
- full melt and freeze plateaus
- Comparison of new constructed 6N and 5N AgFP cells with IMBiH AgFP open cell





Thank you for your attention!