

# ISOLDE Operations, YETS and plans for 2022

J. Vollaire on behalf of technical and operation teams

**Slides from:** K. Chrysalidis, R. Heinke, E. Siesling and S. Stegemann



- Technical feedbacks since the last ISCC (mid-June)
- Summary of target production & Fast Tape Station
- RILIS highlights
- Coming YETS (Year End Technical Stop) and plans for 2022

# Technical Highlights (problems & feedbacks)

---

- Excellent performances and availability of different systems (new Frontends)
- Technical problems could be addressed promptly thanks to the availability and commitments of experts:
  - Problem with the fan and temperature sensors for the HRS FE Turbo pumps
  - BTY line (proton beam line) vacuum leak
  - GPS FE: FC door opening, target clamping piston, extraction electrode movement
  - Interference between a shielding door (target storage shelves) and robot gripper
- Target exchanges can be further optimized (duration and resources):
  - Need to patrol all access sectors and have the target area in “Beam Mode” to move the robots (prevent access to the HV room for target setup)
  - Modifications proposed for the coming YETS
- Preventive maintenance will account for failures observed during the run
- Consolidation of interfaces with the ISOLDE robots (shielding doors for shelves and rail conveyor system)

# Technical Highlights (problems & feedbacks)

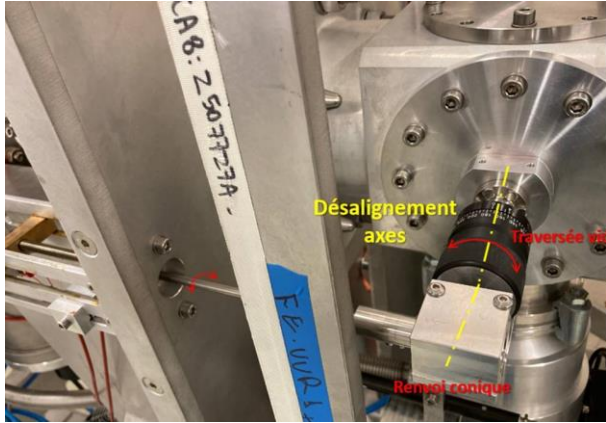
## Extraction Electrode movement problem

Remote visualization prior to human intervention

"blocking part"

➔ Preventive maintenance

Repair



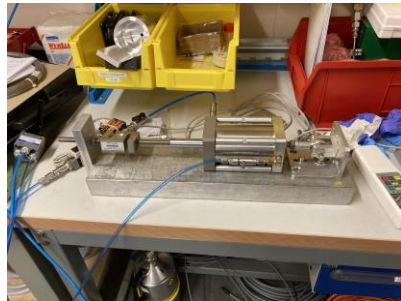
## Faraday cage door piston



➔ Preventive maintenance

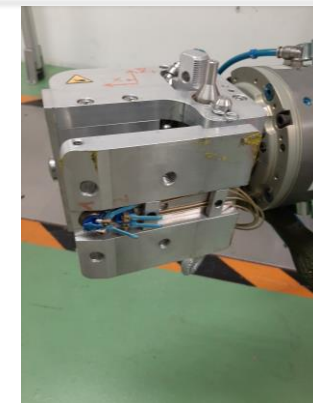
## Investigation of clamping piston performances

➔ Proposed modification



## Damaged sensor on HRS robot gripper (redundant)

➔ Repair during YETS

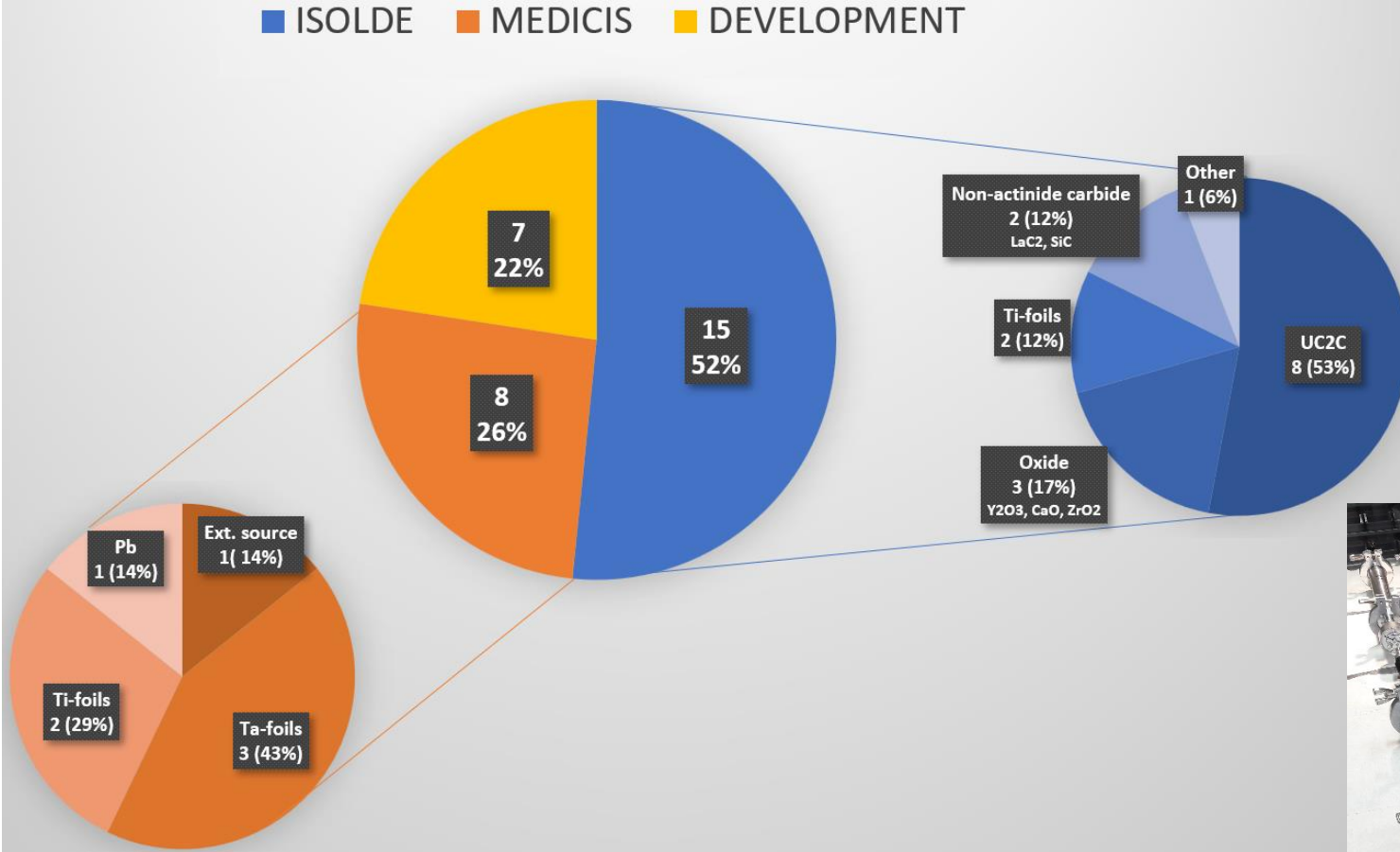


- Technical feedbacks since the last ISCC (mid-June)
- **Summary of target production & Fast Tape Station**
- RILIS highlights
- Coming YETS (Year End Technical Stop) and plans for 2022

# Target production operation 2021

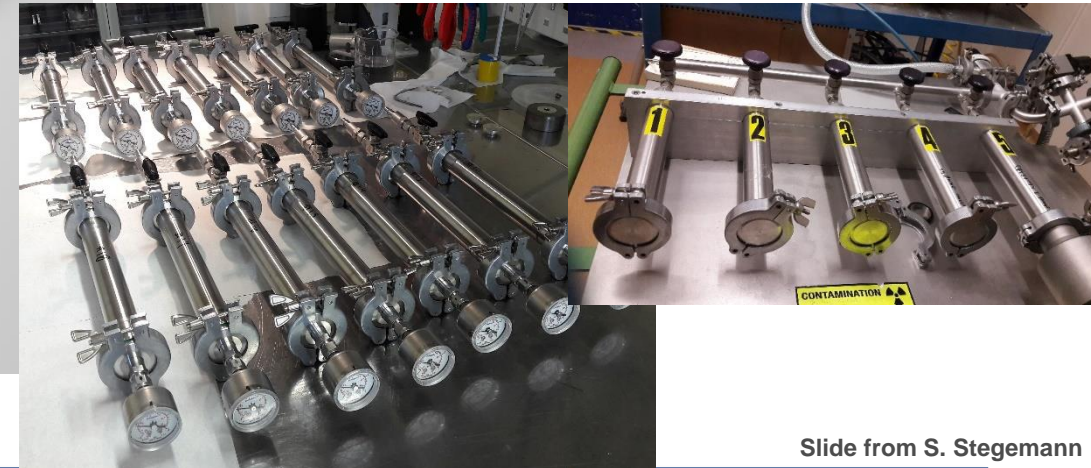
## Target production:

■ ISOLDE ■ MEDICIS ■ DEVELOPMENT



## ISOLDE on-line operation

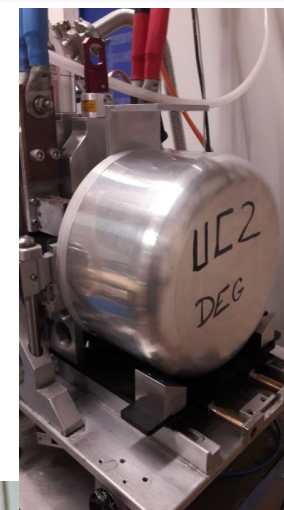
- All ISOLDE targets went online
- Additionally, 8 'old' targets have been recuperated
- UC<sub>2</sub>C was produced from pre-made charges prepared in 2020 and stored
  - 10 carburized
  - 5 un-carburized



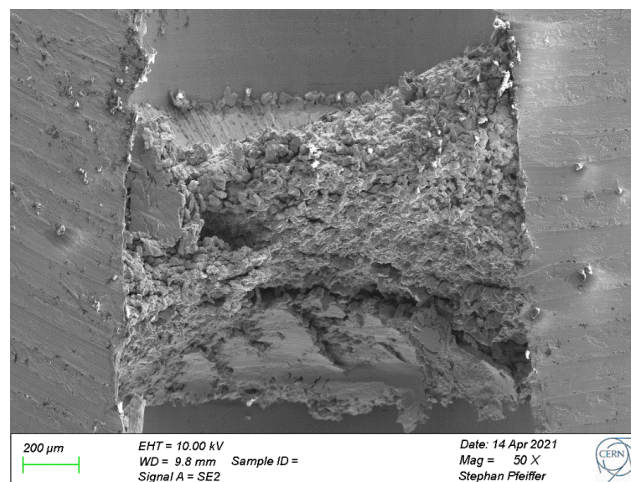
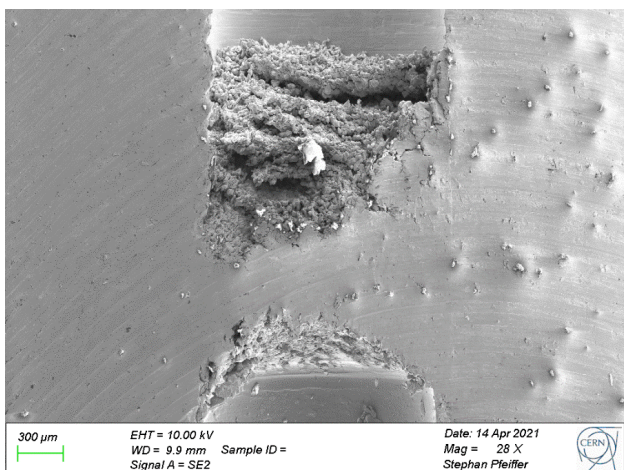
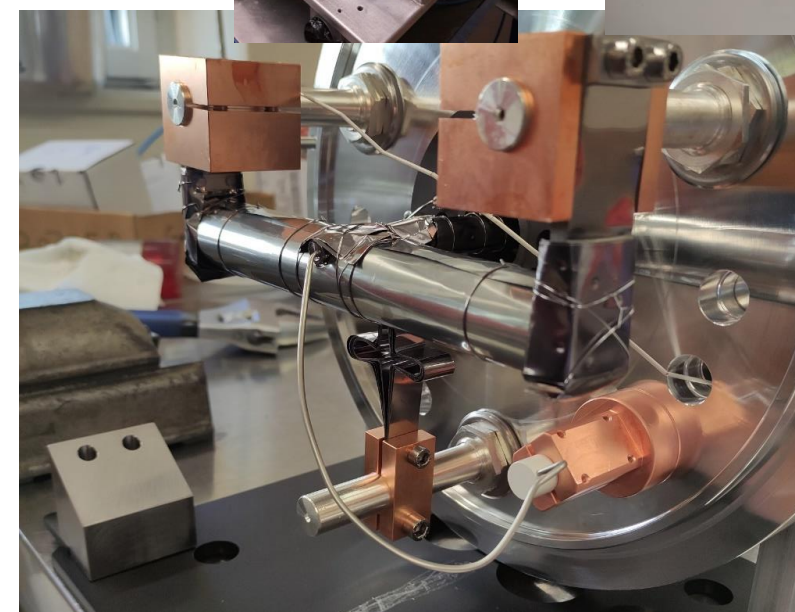
Slide from S. Stegemann

# Feedbacks target production & operation

- Pre-making UC<sub>2</sub>C charges worked overall well!
  - Possibility to better distribute production workload
- Prolonged outgassing in some cases (and other older targets)
  - Issue since outgassing & carburization pump stands not available
  - Working on re-installation and readiness for 2022
- Calibrated leak clogging
  - Observed occasionally (at offline fortunately)
  - Developing improved leak installation



Pump stand in new lab



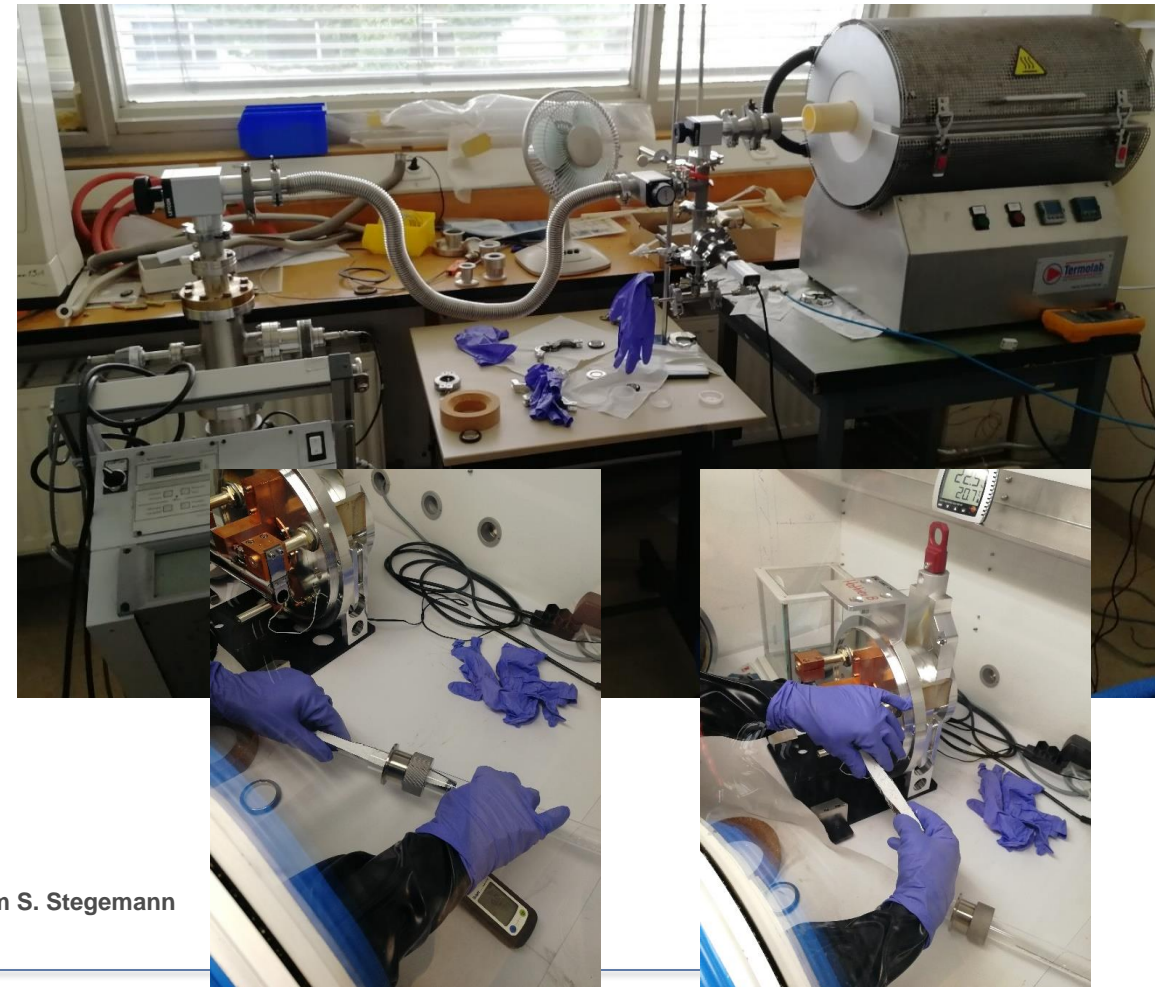
# Target material production

- Production went well despite personnel shortage
- Some more complex materials (eg CaO,  $Y_2O_3$ ) require dedicated setups, space and time
- ❖ Bottleneck: production material development
- ❖ Eg, glove box required to load  $O_2$ -sensitive materials, as well as for nano-target development



## CaO production

(Decarbonation setup that allows transport in inert atmosphere to glove box)



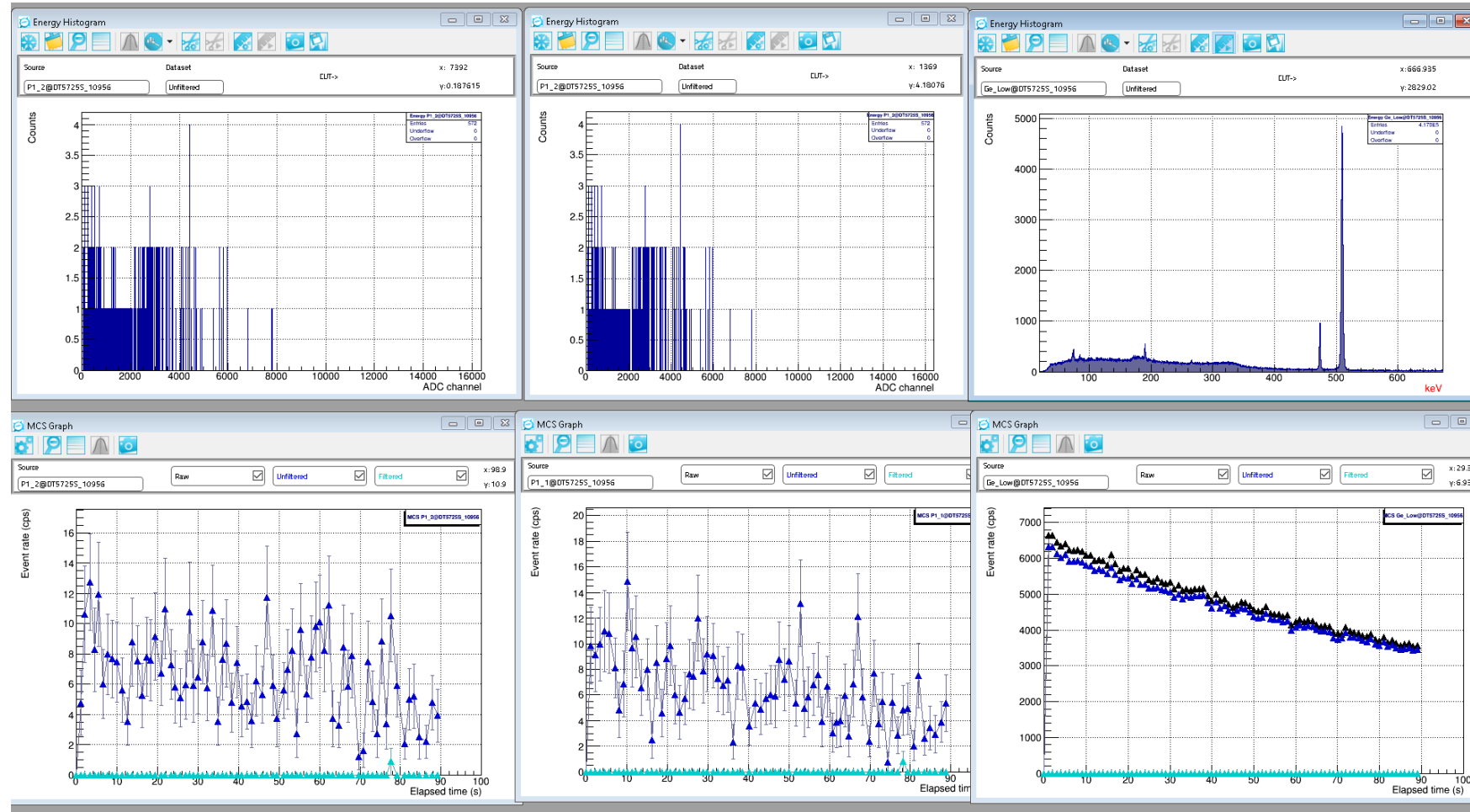
Slide from S. Stegemann



# Fast Tape Station (installed during LS2)

- New fast tape station (ISCC June) works very well!
- Equipped with:
  - In-beam detector
  - $4\pi$   $\beta$ -detector
  - $\gamma$ -detector
- Transport time  $\sim 100$  ms!
- DAQ with online visualization proved to be very useful

Special thanks to Razvan Lica



But:

- Missing  $\alpha$ -detector
  - Limiting for heavy systems
- Tape station has a free slot for such a detector
- Working on installation

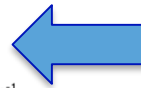
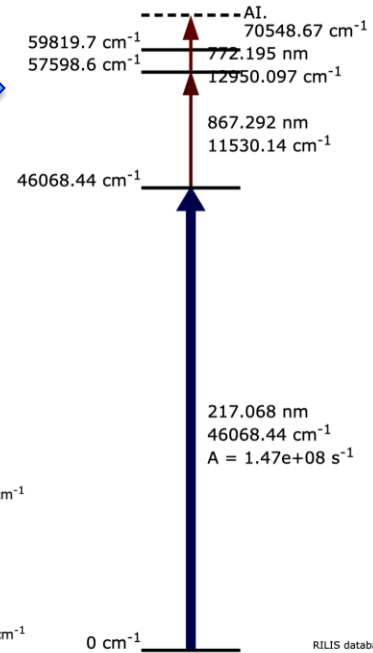
Slide from S. Stegemann

- Technical feedbacks since the last ISCC (mid-June)
- Summary of target production & Fast Tape Station
- **RILIS highlights**
- Coming YETS (Year End Technical Stop) and plans for 2022

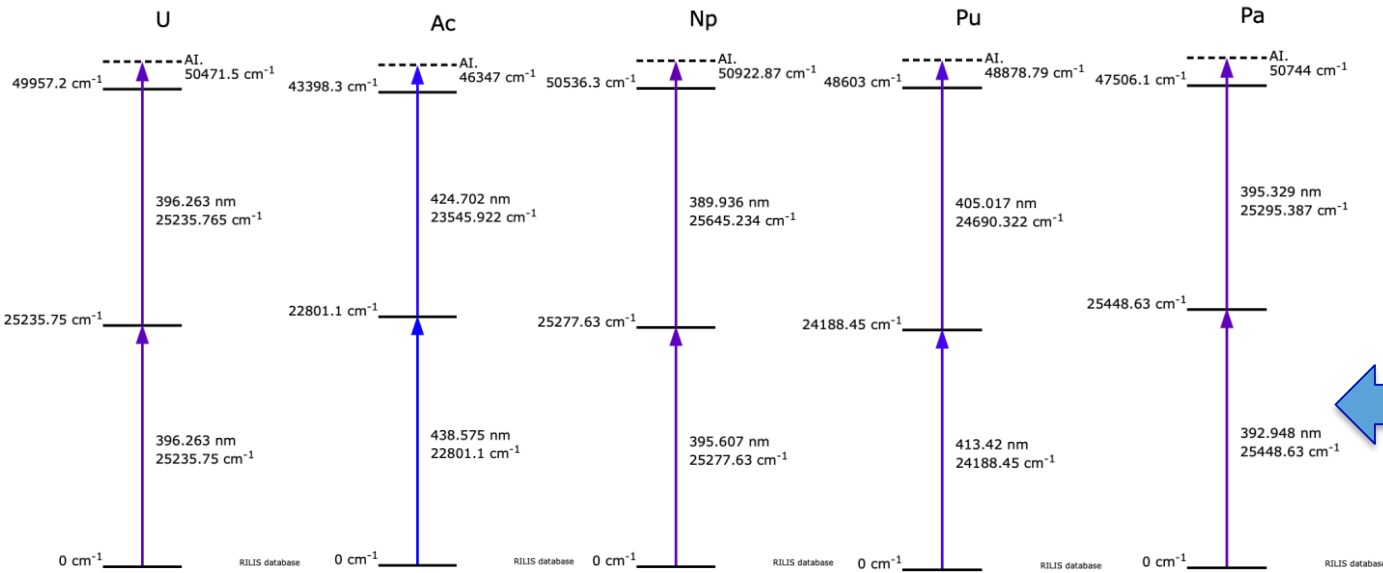
# RILIS operation 2021

- No major pump-laser failures this year!
- Elements: Ag, Mg, Cu, Ca, In, Au, Ac, Zn, **Pb\***,
- Sb, Dy, Sc, Be
- physics runs: 17
- **TISD runs\***: 4
- Overall **21 weeks out of 23 weeks of ISOLDE operations**

- New Pb laser ionization scheme
- Developed Jan 2021 (Master thesis R. Mancheva, Sofia university)
- First used on-line Sep 2021
- **Efficiency enhancement by factor 10!**

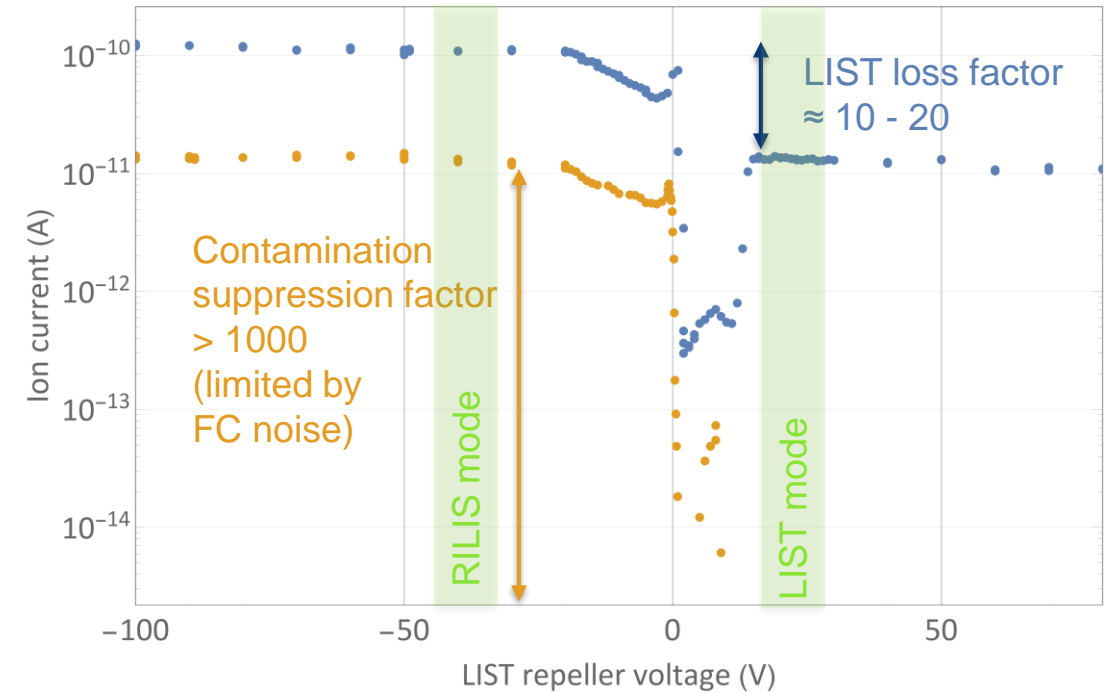
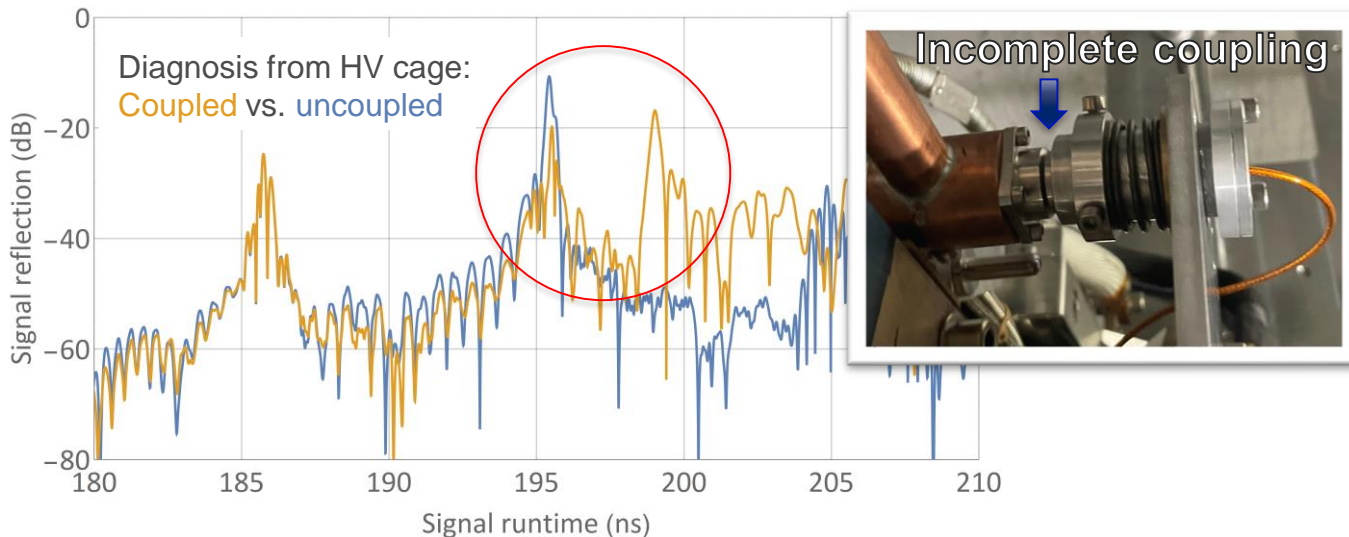


- **TISD on Actinides extraction for LISA student projects**
- Many actinide schemes tested on-line
- Np, Pu, Ac were seen!
- Additionally molecular extraction tested



# LIST TISD October 2021

- Scheduled yield / contamination checks for multiple requested beams: **Sn, In, Tl, Ba, Yb, Ac**
- Not successful due to failed connector coupling
  - Remotely identified via vector network analyzer device
  - Confirmed by visual inspection
  - Coupling modification ongoing, tbc in YETS



- After manual intervention for coupling:  
Promising preliminary results with stable In from last night of run

Slide from R. Heinke

- Technical feedbacks since the last ISCC (mid-June)
- Summary of target production & Fast Tape Station
- RILIS highlights
- Coming YETS (Year End Technical Stop) and plans for 2022

## YETS 21/'22 for the target area/separator zones and HV room

---

- **Minimum required interventions for maintenance and repair:**
  - Target transport (required before start of shutdown activities)
  - Frontend maintenance (extraction electrode exchange, greasing of movable parts, cleaning...)
  - Minimum vacuum intervention (pump maintenance needed every 2 years)
  - Ventilation system maintenance (two weeks with limited access possibilities)
  - Tests and maintenance of handling systems (robots & rail conveyor systems)
  - Consolidations (gas exhaust line, oil recovery) and maintenance in the HV room
  - Maintenance activities in the separator zones (laser windows exchange...)
  - Repair improvements following 2021 operational feedbacks

## YETS 21/'22 : key dates for the target area / low energy lines

---

- Saturday 8<sup>th</sup> of January: Target transport (required for shutdown activities)
- Shutdown activities (with accesses) until the Friday 28<sup>th</sup> of January
- 27<sup>th</sup> of January, DSO tests (re-validation of access and personnel protection safety systems)
- Ventilation maintenance from the 31/01 to the 14/02 (no accesses but hardware commissioning and stable beam possible)
- Water cooling back as of the 04/02: start of stable beam commissioning (no accesses to Faraday cages, HV room, separator zones)
- From 14/02 to 18/02 activities outside the Faraday cages (ventilation back)
- Installation of the SEMGRID target on GPS on the 17/02
- Monday 21<sup>th</sup> Feb: First protons to ISOLDE (BTY line commissioning)
- Commissioning with beam (protons) until March 14<sup>th</sup>: **Start first Low E Physics**

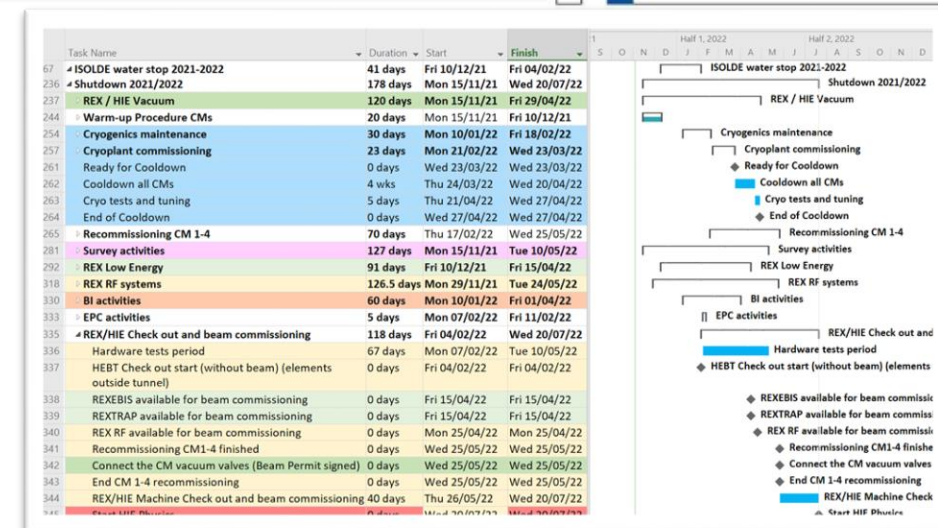
# YETS 21/'22 schedule: REX/HIE ISOLDE Key-Dates:

## Cryo driven planning:

Cryo continuing over the annual Christmas break is unfortunately not possible:

A study was carried out by Cryo, SRF, CV and EL and results presented at the IEFC meeting (26<sup>th</sup> March) and ISCC (16<sup>th</sup> June).

A full warm-up and cooldown cycle with the complications of a time consuming SRF reconditioning, and beam recommissioning will need to be carried out again this shutdown '21/'22.



## Key-dates and planning drivers:

- End of protons to ISOLDE / End of HIE physics: 15<sup>th</sup> Nov
- Warm-up of the HIE SC linac starts on the 15<sup>th</sup> Nov and the following weeks
- Stop of all cooling water and lock-out power supplies as of the 10<sup>th</sup> Dec
- Cryo primary water back 26<sup>th</sup> Jan, all other as of 4<sup>th</sup> Feb -> Unlocking power supplies and start of Hardware Test period
- Cryo maintenance until 21<sup>st</sup> Feb followed by recommissioning of the plant.  
Cooldown of the Cryo Modules 24<sup>th</sup> March – 27<sup>th</sup> April (possibly 1wk earlier)
- Cryo Modules 1-4 recommissioning and RF reconditioning at cold (4.5K) until 25<sup>th</sup> May
- Start of machine check-out and (stable) beam commissioning as of 25<sup>th</sup> May
- HIE ISOLDE (RIB) Physics start as of 20<sup>th</sup> July



# YETS 21/'22 schedule: REX/HIE ISOLDE activities:

## HEBT:

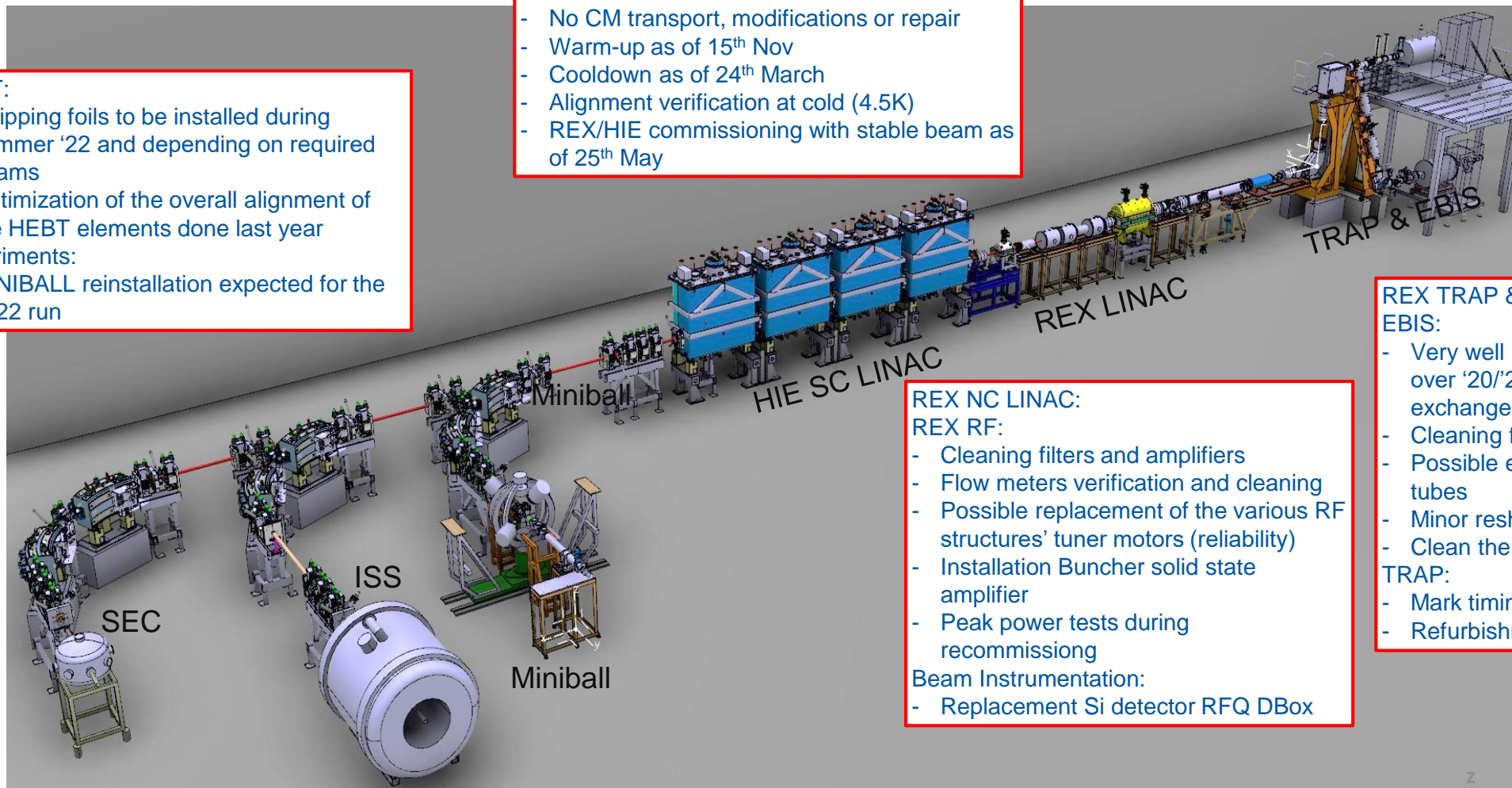
- Stripping foils to be installed during summer '22 and depending on required beams
- Optimization of the overall alignment of the HEBT elements done last year

## Experiments:

- MINIBALL reinstallation expected for the 2022 run

## HIE SC LINAC:

- No CM transport, modifications or repair
- Warm-up as of 15<sup>th</sup> Nov
- Cooldown as of 24<sup>th</sup> March
- Alignment verification at cold (4.5K)
- REX/HIE commissioning with stable beam as of 25<sup>th</sup> May



## REX NC LINAC:

### REX RF:

- Cleaning filters and amplifiers
- Flow meters verification and cleaning
- Possible replacement of the various RF structures' tuner motors (reliability)
- Installation Buncher solid state amplifier
- Peak power tests during recommissioning

### Beam Instrumentation:

- Replacement Si detector RFQ DBox

## REX TRAP & EBIS:

### EBIS:

- Very well performing new gun over '20/'21 but possible cathode exchange to guarantee lifetime
- Cleaning flow meters
- Possible exchange of cooling tubes
- Minor reshuffle equipment
- Clean the HV cage

### TRAP:

- Mark timing cabling
- Refurbishment local Ion source

---

THANK YOU FOR YOUR ATTENTION

# Target material development



CERN  
CH1211 Geneva 23  
Switzerland

EDMS NO. <b>2596262</b>	REV. <b>2</b>	VALIDITY <b>Draft</b>
----------------------------	------------------	--------------------------

REFERENCE <b>XXXX</b>
--------------------------

Date: 2021-07-09

## Operational Procedure

### Production of nano-LaOH + multiwalled carbon nanotube powder pellets for ISOLDE target production

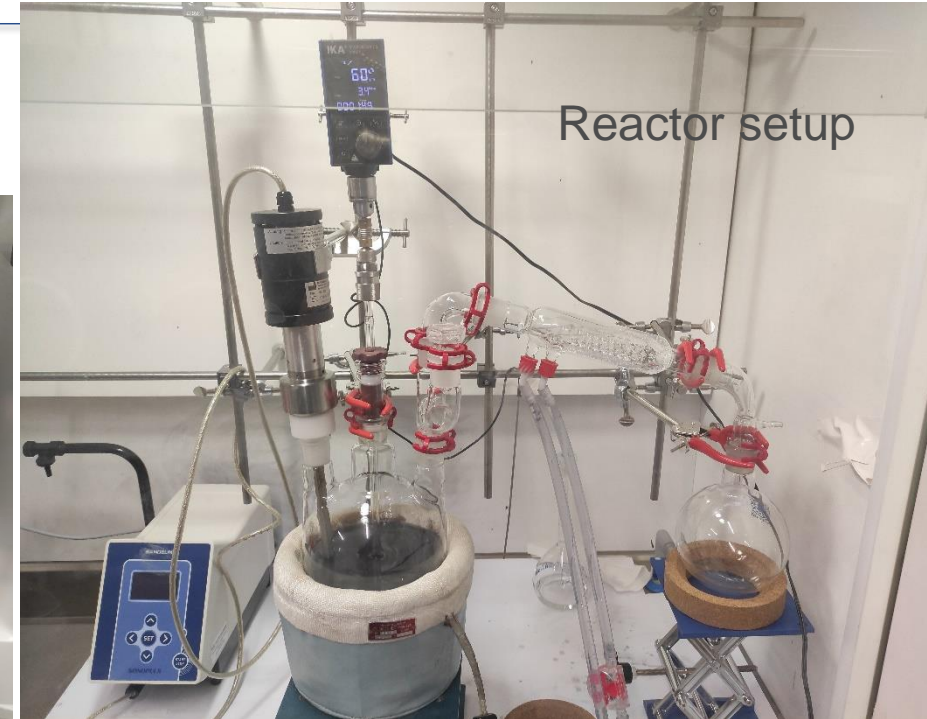
- Preparation of  $\text{La}(\text{OH})_3$ +MWCNT pills for nano- $\text{LaC}_x$  targets
- Glove box enclosure
  - Powder weighing and transfer
  - Pill pressing
- Planetary ball mill
  - $\text{La}(\text{OH})_3$  particle size reduction
- Reactor setup
  - Wet dispersion mixing of  $\text{La}(\text{OH})_3$  and MWCNTs

- Procedure proved to be feasible
- Waiting for final safety approval

➔ Important step toward nano- $\text{UC}_x$  production



Ball mill



Reactor setup



weighing

Slide from S. Stegemann

# Development and characterization equipment

Planetary ball mill – Powder particle size reduction



Laser diffraction particle size analyzer



Gas sorption – Pore size distribution



Carburization pumpstand

Target development, target sintering studies,...

Gas pycnometry - Apparent density determination



TGA-MS – Reaction kinetics



