ISOLDE Technical Report

J. Vollaire on behalf of technical and operation teams

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

Outline

- Status of the facility since the last INTC (June)
- Summary of target production & Fast Tape Station
- RILIS highlights
- Coming Year End Technical Stop and plans for 2022

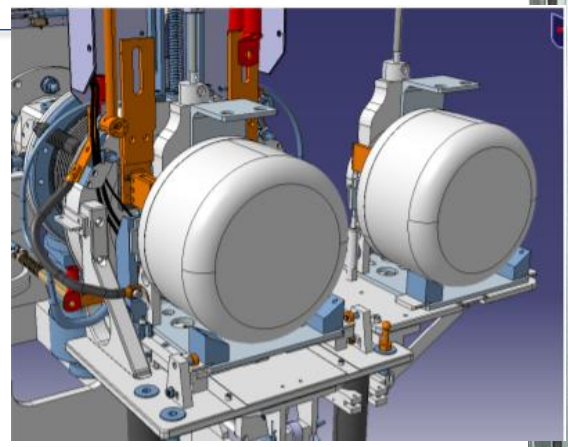
Technical Highlights (problems & feedbacks)

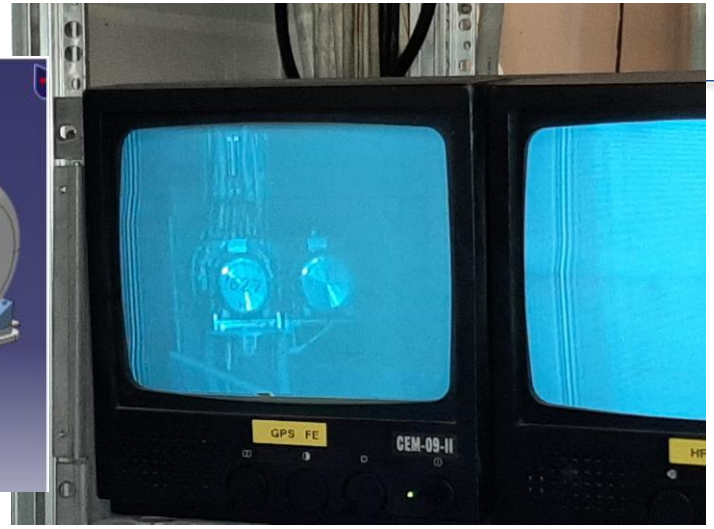
- Excellent performances and availability of systems (new Frontends)
- New irradiation station at GPS tested successfully yesterday

- Technical problems could be addressed promptly thanks to the availability and commitments of experts:
  - Problem with the cooling and sensor for the HRS FE Turbo pumps
  - BTY line (proton beam line) vacuum leak
  - GPS FE: FC door opening, target clamping piston, extraction electrode movement
- Preventive maintenance will account for failures observed during the run

Some Technical Highlights

- Irradiation of target #635 (UCx) located after the online target (#627 tantalum)
- HV compatibility and radiation protection measurements
- Target #635 will be irradiated all week and used for the winter physics program

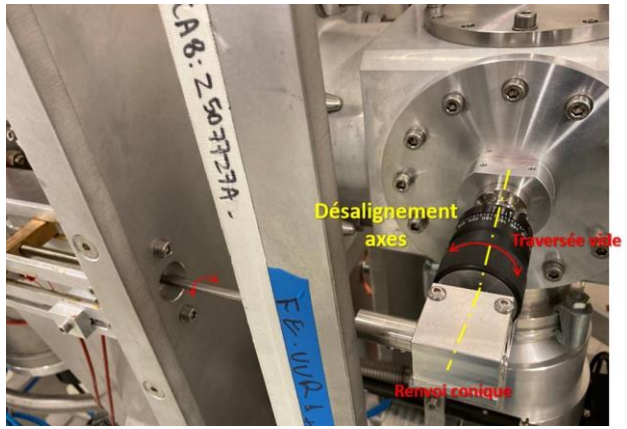




Extraction Electrode movement problem

Remote visualization prior to human intervention

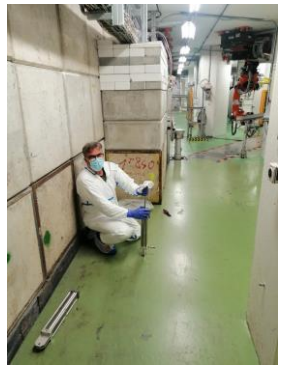
"blocking part"



➡ Preventive maintenance

Repair

Faraday cage door piston



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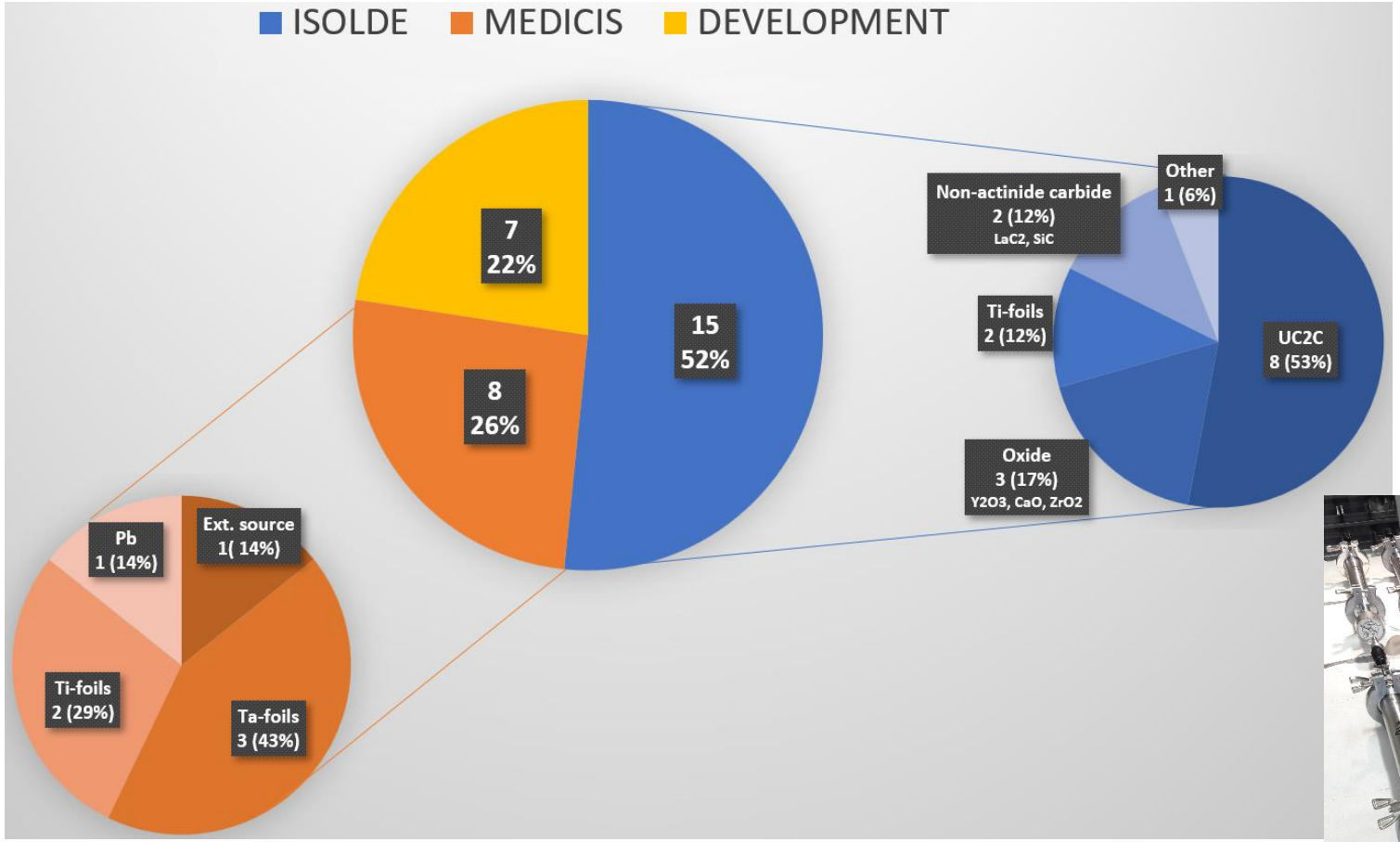
Target production operation 2021

Target production:



ISOLDE on-line operation

- All ISOLDE targets went online
- Additionally, 8 ‘old’ targets have been recuperated

- UC_2C was produced from pre-made charges prepared in 2020 and stored
  - 10 carburized
  - 5 un-carburized

Slide from S. Stegemann

Feedbacks target production & operation

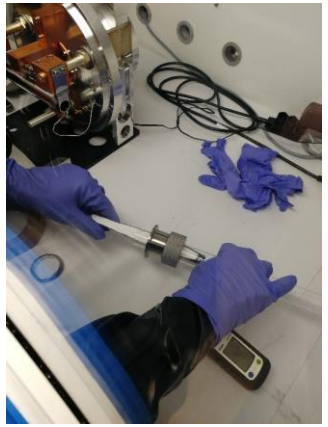
- Pre-making UC_2C charges worked overall well!
  - ➢ Possibility to better distribute production workload
- Prolonged outgassing in some cases (and other older targets)
  - Issue since outgassing & carburization pump stands not available
  - ➢ Working on re-installation and readiness for 2022
- For none actinide, some more complex materials (eg CaO, Y_2O_3) required dedicated setups, space and time

Pump stand in new lab

CaO production

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

glove box required to load O_2-sensitive materials nano-target development



Slide from S. Stegemann

Fast Tape Station (installed during LS2)

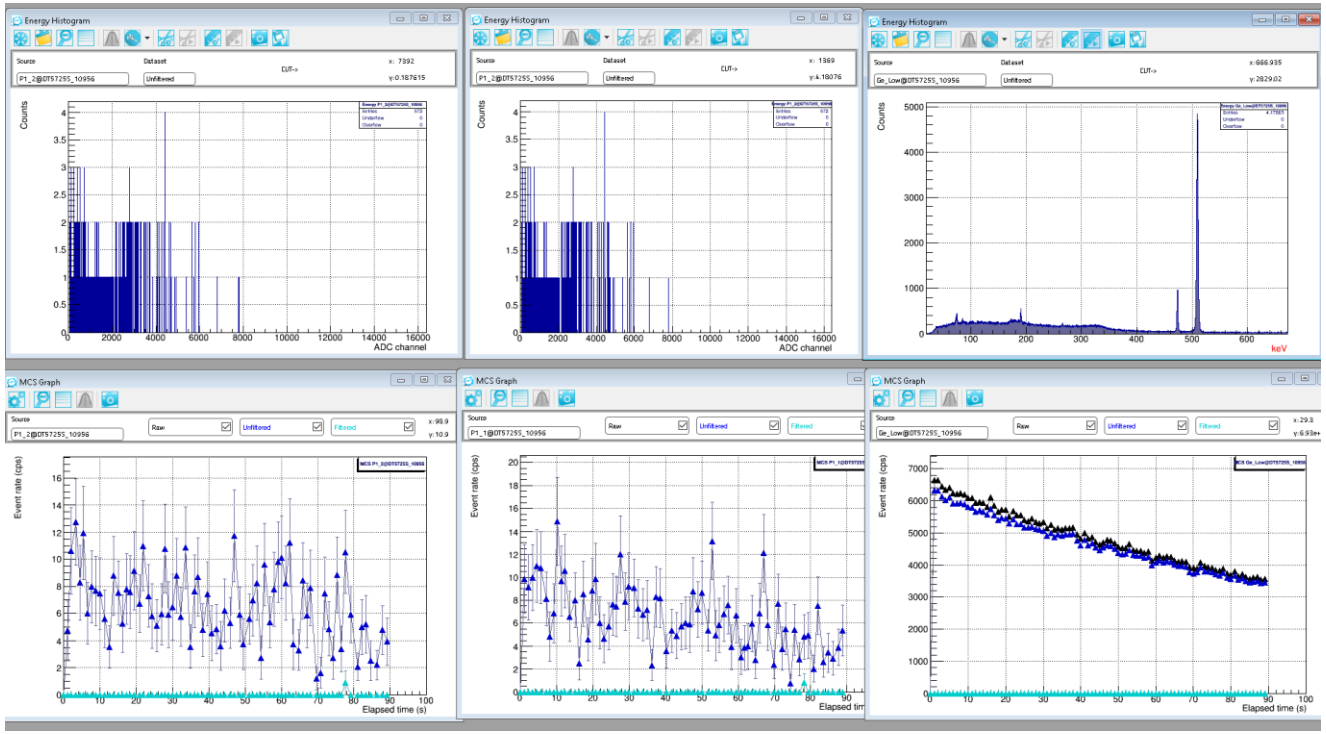
- New fast tape station works very well!
- Equipped with:
  - In-beam detector
  - 4π β-detector
  - γ-detector
- Transport time ~100 ms!
- DAQ with online visualization proved to be very useful

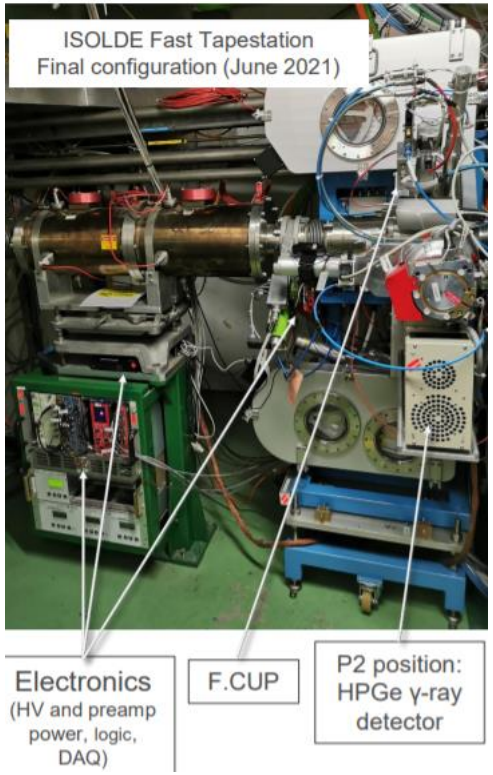
Next step:

- Missing α-detector
  - Limiting for heavy systems

➢ Tape station has a free slot for such a detector

➢ Working on installation





Special thanks to Razvan Lica

Slide from S. Stegemann

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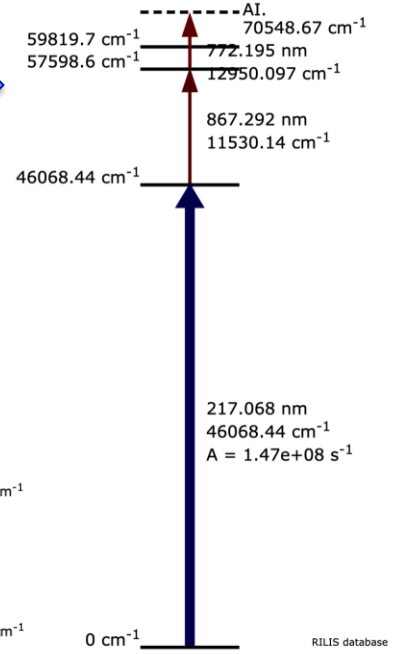
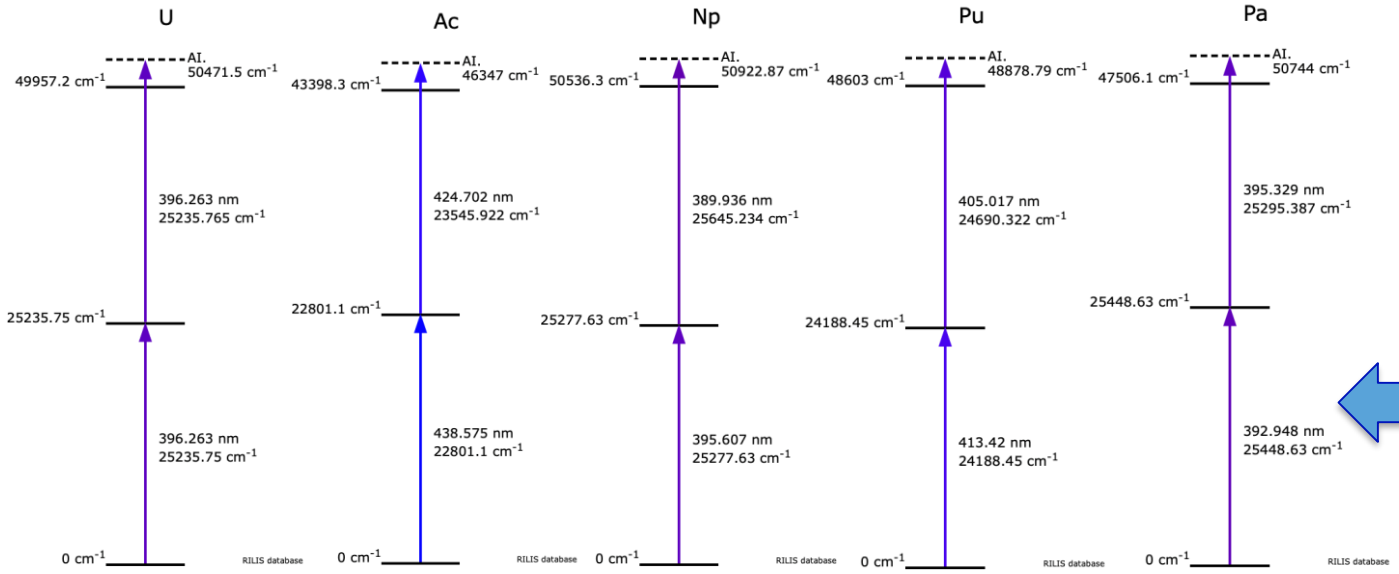
RILIS operation 2021

- 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!



LISA
LASER IONISATION AND SPECTROSCOPY OF ACTINIDES

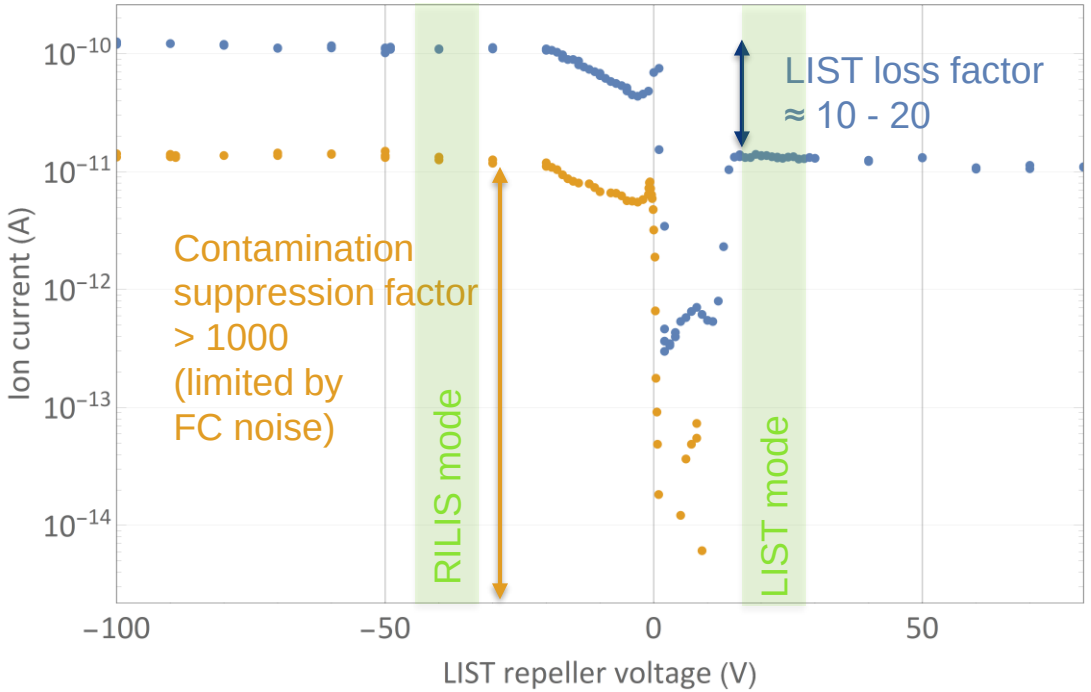
- TISD on Actindes extraction for LISA student projects
- Many actinide schemes tested on-line
- Np, Pu, Ac were seen!
- Additionally molecular extraction tested

Slide from K. Chrysalidis

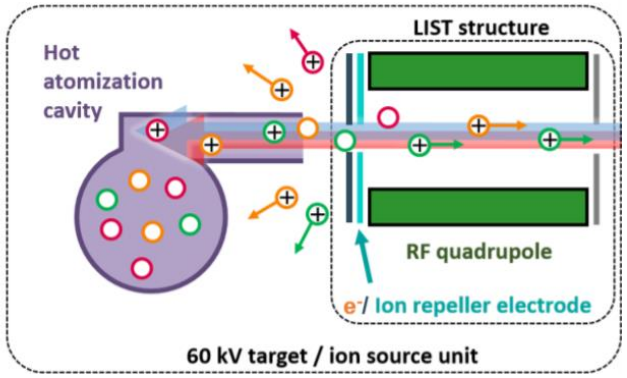
LIST TISD October 2021

- Scheduled yield / contamination checks

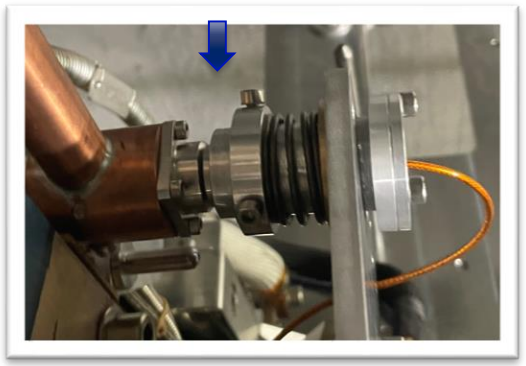
  for multiple requested beams: **Sn, In, Tl, Ba, Yb, Ac**
- Not successful due to failed connector coupling
  - Remotely identified via vector network analyzer device
  - Confirmed by visual inspection
  - Coupling modification ongoing, tbc in YETS



Laser Ion Source and Trap (LIST)



Incomplete coupling to RF connector



- After manual intervention for coupling:

  Promising preliminary results with stable In from last night of run

Slide from R. Heinke

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

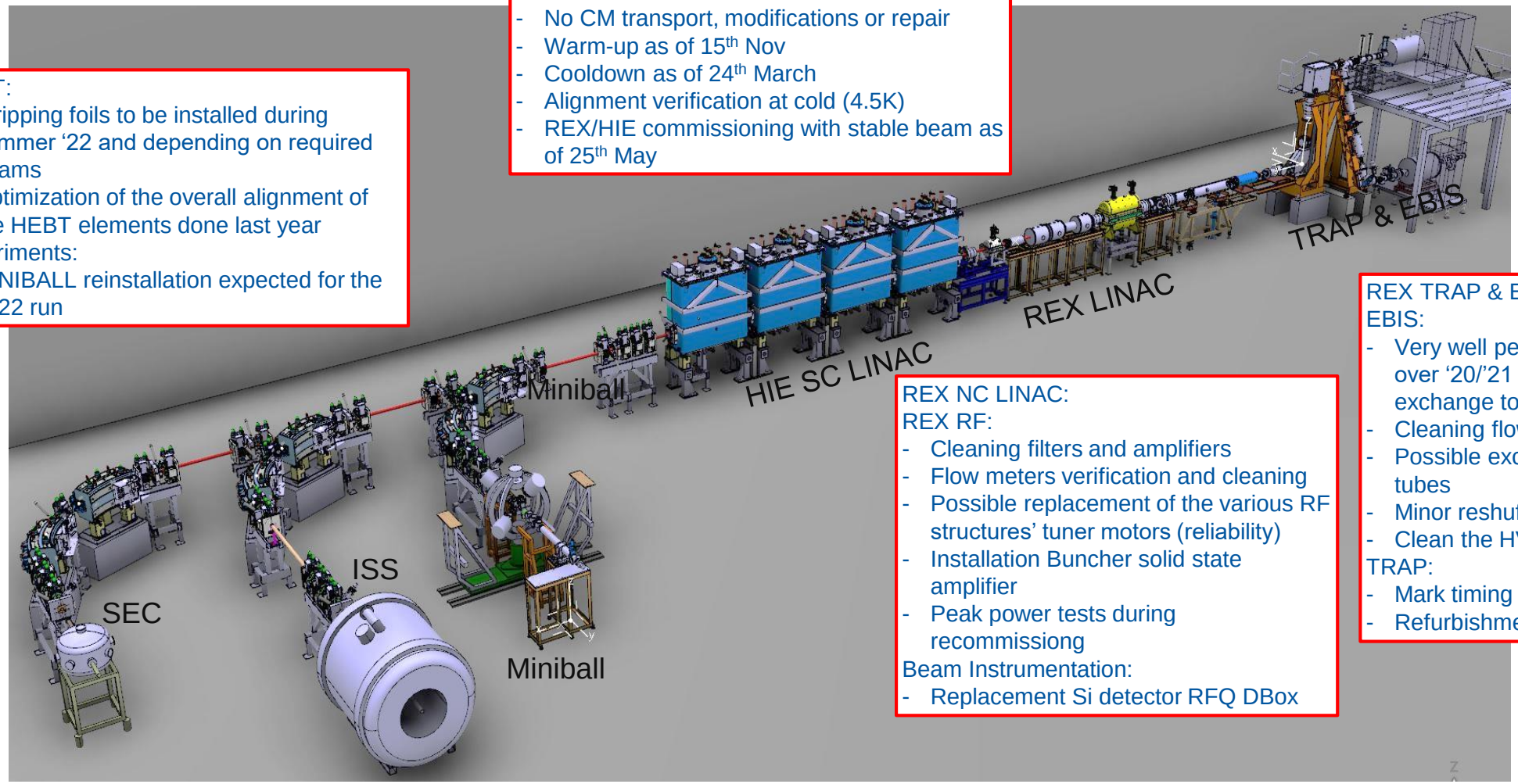
- **Minimum required interventions for maintenance and repair:**
  - Target transport (required before start of shutdown activities)
  - Frontend maintenance (extraction electrode exchange, greasing of movable parts, cleaning…)
  - Ventilation system maintenance (two weeks with limited access possibilities)
  - 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 schedule: REX/HIE ISOLDE activities

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

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



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 recommissiong

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

Slide from E. Siesling

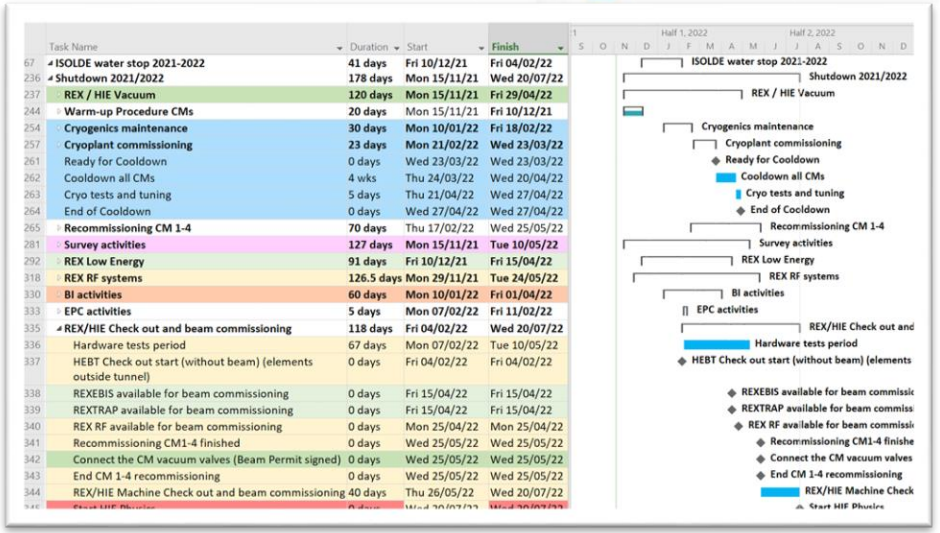
YETS 21/'22 : key dates (low E)

- Stop of protons on the 15/11 early morning followed by 3 weeks of "winter physics" with pre-irradiated targets (06/12)
- Shutdown activities until Friday 28th of January
- 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: stable beam commissioning
- First protons to ISOLDE (BTY line commissioning)
- Commissioning with beam (protons) until March 14th:

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 (26th March) and ISCC (16th 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.



	Task Name	Duration	Start	Finish
67	ISOLDE water stop 2021-2022	41 days	Fri 10/12/21	Fri 04/02/22
236	Shutdown 2021/2022	178 days	Mon 15/11/21	Wed 20/07/22
237	REX / HIE Vacuum	120 days	Mon 15/11/21	Fri 29/04/22
244	Warm-up Procedure CMs	20 days	Mon 15/11/21	Fri 10/12/21
254	Cryogenics maintenance	30 days	Mon 10/01/22	Fri 18/02/22
257	Cryoplant commissioning	23 days	Mon 21/02/22	Wed 23/03/22
261	Ready for Cooldown	0 days	Wed 23/03/22	Wed 23/03/22
262	Cooldown all CMs	4 wks	Thu 24/03/22	Wed 20/04/22
263	Cryo tests and tuning	5 days	Thu 21/04/22	Wed 27/04/22
264	End of Cooldown	0 days	Wed 27/04/22	Wed 27/04/22
265	Recommissioning CM 1-4	70 days	Thu 17/02/22	Wed 25/05/22
281	Survey activities	127 days	Mon 15/11/21	Tue 10/05/22
292	REX Low Energy	91 days	Fri 10/12/21	Fri 15/04/22
318	REX RF systems	126.5 days	Mon 29/11/21	Tue 24/05/22
330	BI activities	60 days	Mon 10/01/22	Fri 01/04/22
333	EPC activities	5 days	Mon 07/02/22	Fri 11/02/22
335	REX/HIE Check out and beam commissioning	118 days	Fri 04/02/22	Wed 20/07/22
336	Hardware tests period	67 days	Mon 07/02/22	Tue 10/05/22
337	HEBT Check out start (without beam) (elements outside tunnel)	0 days	Fri 04/02/22	Fri 04/02/22
338	REXEBIS available for beam commissioning	0 days	Fri 15/04/22	Fri 15/04/22
339	REXTRAP available for beam commissioning	0 days	Fri 15/04/22	Fri 15/04/22
340	REX RF available for beam commissioning	0 days	Mon 25/04/22	Mon 25/04/22
341	Recommissioning CM1-4 finished	0 days	Wed 25/05/22	Wed 25/05/22
342	Connect the CM vacuum valves (Beam Permit signed)	0 days	Wed 25/05/22	Wed 25/05/22
343	End CM 1-4 recommissioning	0 days	Wed 25/05/22	Wed 25/05/22
344	REX/HIE Machine Check out and beam commissioning	40 days	Thu 26/05/22	Wed 20/07/22

Key-dates and planning drivers:

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

HIE ISOLDE (RIB) Physics start as of 20th July

Slide from E. Siesling

THANK YOU FOR YOUR ATTENTION

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