

# 98th ISOLDE Collaboration Committee meeting -

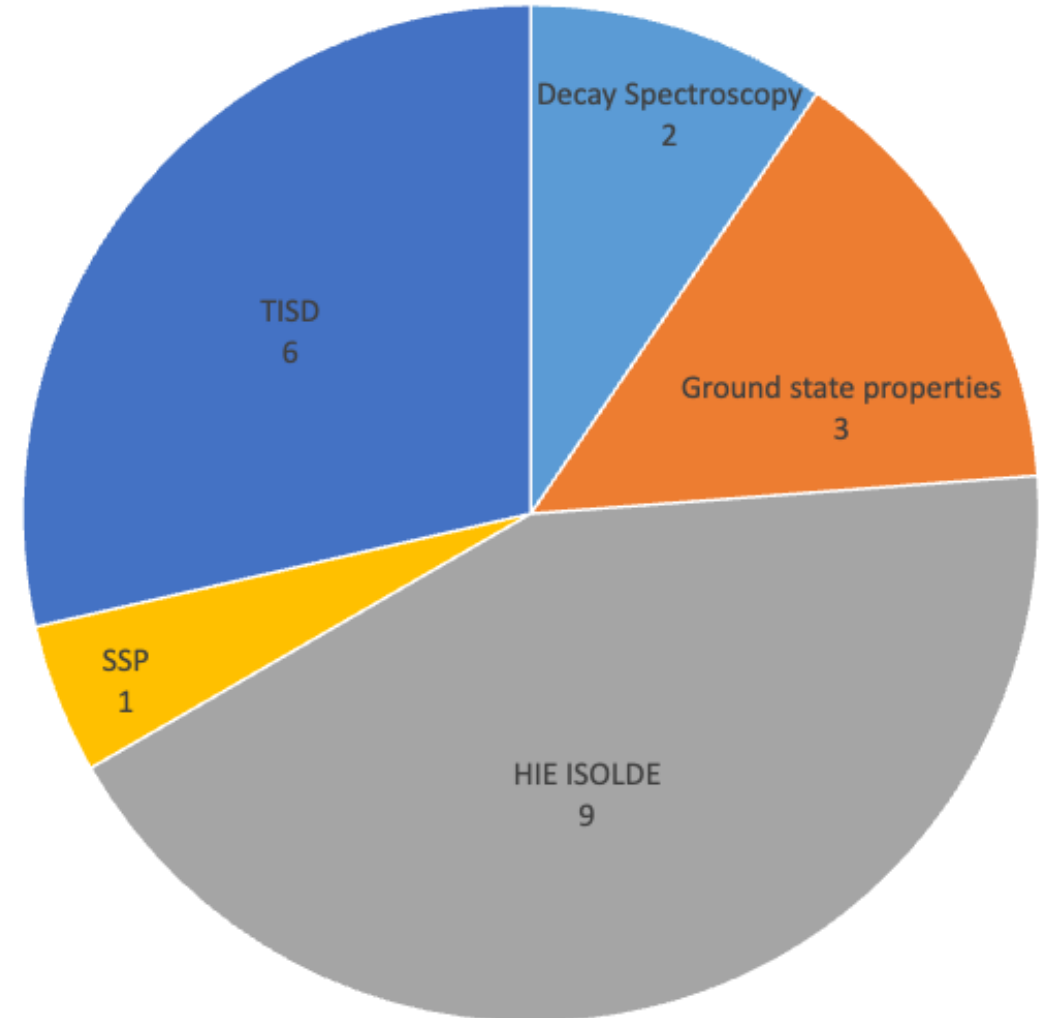
- INTC summary
- Schedule for 2023 and restart in 2024
  - Feedback from runs 2023
  - TISD report
- HIE-ISOLDE issues

# INTC 74 summary (ISOLDE only)

| Overview                | Submissions | Shifts |
|-------------------------|-------------|--------|
| ◦ ISOLDE                | 21          | 301    |
| Addendum to LOI         | 2           | 40     |
| Letter of Clarification | 2           | 12     |
| Letter of intent        | 6           | 41     |
| Proposal                | 11          | 208    |

| Proposals                | Documents | Requested shifts | Awarded shifts |
|--------------------------|-----------|------------------|----------------|
| ◦ ISOLDE                 | 21        | 301              | 175            |
| Full                     | 12        | 154              | 154            |
| Not supported            | 3         | 40               | 0              |
| Partial                  | 2         | 37               | 19             |
| Retracted                | 2         | 37               | 2              |
| Asked to submit proposal | 1         | 24               | 0              |
| Asked for CLL            | 1         | 9                | 0              |

Submitted documents per subject area



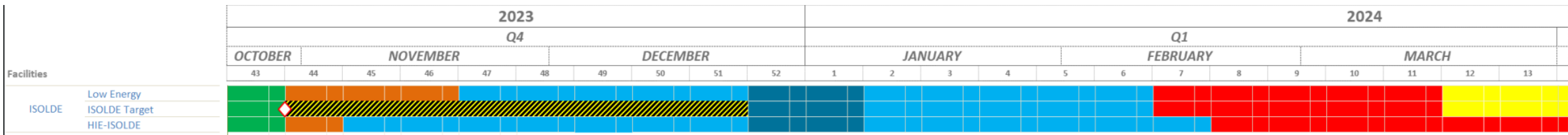
# Experimental shifts on the books

| Setup                   | HIE ISOLDE setup | Count of Exp. no. | Sum of Shifts remaining after 2023 |
|-------------------------|------------------|-------------------|------------------------------------|
| ASCII                   | N/A              | 1                 | 6,5                                |
| biophysics              | N/A              | 1                 | 2,5                                |
| COLLAPS                 | N/A              | 4                 | 14                                 |
| COLLAPS/ISOLTRAP        | N/A              | 1                 | 13                                 |
| Collections             | N/A              | 4                 | 62                                 |
| CRIS                    | N/A              | 12                | 107,5                              |
| Decay spectroscopy      | N/A              | 1                 | 8                                  |
| Gandalph                | N/A              | 3                 | 26                                 |
| HIE ISOLDE              | ISS              | 18                | 164                                |
|                         | ISS/Miniball     | 2                 | 22                                 |
|                         | Miniball         | 18                | 189                                |
|                         | Prototype        | 1                 | 0                                  |
|                         | XT03             | 5                 | 110                                |
| IDS                     | N/A              | 14                | 135,5                              |
| IDS/ISOLTRAP            | N/A              | 1                 | 6                                  |
| IDS/TAS                 | N/A              | 1                 | 3                                  |
| ISOLDE upgrade          | N/A              | 1                 | 0                                  |
| ISOLTRAP                | N/A              | 9                 | 91                                 |
| LA1/ECSLI               | N/A              | 1                 | 13                                 |
| Medical physics         | N/A              | 2                 | 5                                  |
| MIRACLS                 | N/A              | 1                 | 17                                 |
| Multipac                | N/A              | 1                 | 6                                  |
| SSP                     | N/A              | 16                | 124,5                              |
| SSP/TISD                | N/A              | 1                 | 3                                  |
| TAS                     | N/A              | 5                 | 6,5                                |
| TISD                    | N/A              | 17                | 81                                 |
| TISD/IDS                | N/A              | 1                 | 0                                  |
| TISD/Miniball           | Miniball         | 1                 | 4                                  |
| TISD/TDPAC              | N/A              | 1                 | 4                                  |
| Travelling Setup        | N/A              | 1                 | 19                                 |
| Travelling Setup; ECSLI | N/A              | 1                 | 0                                  |
| VITO                    | N/A              | 4                 | 31                                 |
| WISARD                  | N/A              | 1                 | 24                                 |
| <b>Grand Total</b>      |                  | <b>151</b>        | <b>1298</b>                        |

HIE-ISOLDE:  
485 shifts (out of 1298 total) → ~40%

- Includes:
- outcome of INTC74 (Nov2023)
  - Preliminary shift counting for 2023

# Yearly Technical Stop (YETS) and 2024 Restart



## Key dates

- 30<sup>th</sup> October 2023 – End of proton physics and start of winter physics
- 6<sup>th</sup> November 2023 – End of HIE winter physics (1 wk)
- ➔ • 20<sup>th</sup> November 2023 – End of Low Energy winter physics (3 wks)
- 19<sup>th</sup> February 2024 – Start of Target, Low E and HIE ISOLDE HW Commissioning
- 18<sup>th</sup> March 2024 – Start of Target and Low E Beam commissioning (first protons to ISOLDE 28<sup>th</sup> March. SEMGRID tests 28<sup>th</sup> March – 8<sup>th</sup> April)
- ➔ • **8<sup>th</sup> April 2024 – End of the Low E and Target Beam Commissioning / Start of Low E Physics**
- 13<sup>th</sup> May 2024 – Start of HIE-ISOLDE Beam Commissioning
- 21<sup>st</sup> June 2024 – HIE ISOLDE stable beam to exp. Stations
- ➔ • **11<sup>th</sup> July 2024 – Start of HIE ISOLDE Physics**
- 28<sup>th</sup> October 2024 – End of protons

# ISOLDE schedule 2023

Protons for physics to ISOLDE from **10 April – 30 October**  
 → 20% less than 2022 due to energy considerations

HIE-ISOLDE: 21 July

Winter Physics: 30 Oct.

**GPS Schedule 2023**

| April        |          |           | May       |                        |             | June      |           |             | July        |              |               | August            |             |            | September |                |                       | October             |            |              | November             |                      |         |       |            |               |       |                                       |                     |       |                     |    |  |
|--------------|----------|-----------|-----------|------------------------|-------------|-----------|-----------|-------------|-------------|--------------|---------------|-------------------|-------------|------------|-----------|----------------|-----------------------|---------------------|------------|--------------|----------------------|----------------------|---------|-------|------------|---------------|-------|---------------------------------------|---------------------|-------|---------------------|----|--|
| 14           | 15       | 16        | 17        | 18                     | 19          | 20        | 21        | 22          | 23          | 24           | 25            | 26                | 27          | 28         | 29        | 30             | 31                    | 32                  | 33         | 34           | 35                   | 36                   | 37      | 38    | 39         | 40            | 41    | 42                                    | 43                  | 44    | 45                  | 46 |  |
| #777 Ta LIST |          | #818 UC n | IS693     | IS688 (IS722) (nights) | #759 UC q n | Ascension | LOI244    | IS703 (GLM) | IS679 IS713 | IS691        | #818 UC       | IS725 IS673 Colls | TBC 818 UC  | VUV LA1    | IS563     | IS688 (nights) | IS727 50Ca @ 7.5MeV/u | IS724 49Ca @ 7MeV/u | #776 UC    | #811 UC hq n | IS557 80Zn@4.7M eV/u | IS646 79Zn@3.4M eV/u | #776 UC | IS630 | #835 UC 25 | IS688 (IS703) | IS691 | IS697 127g.mIn 131Sb, 133Sb @ 4 MeV/u | IS692 7Be @ 11MeV/u | IS725 | IS725 - 226Ra (GLM) |    |  |
| LOI246       | LOI235   | LOI226    | TAS IS693 |                        |             | IS685     | TAS IS707 |             | IS679 IS713 | IS732 LOI248 | LOI249 LOI250 | 111Cd             | Noble gases |            |           |                |                       |                     |            |              |                      |                      |         |       |            |               |       |                                       |                     |       |                     |    |  |
| RILIS Res    | RILIS In | RILIS In  | RILIS Dy  |                        |             | RILIS Cd  | RILIS Hg  |             |             |              |               |                   |             | RILIS : Ac | RILIS Hg  | RILIS Dy       | RILIS : Ca            | RILIS : Ca          | RILIS : Mg |              |                      |                      |         |       |            |               |       |                                       |                     |       |                     |    |  |

**HRS schedule 2023**

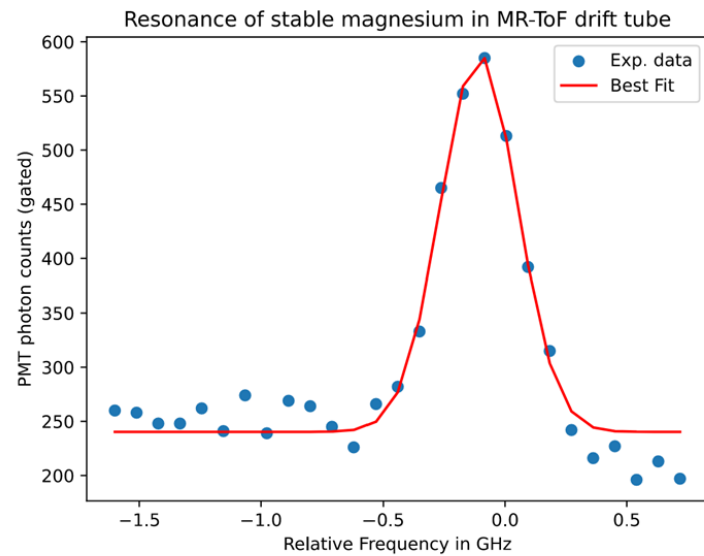
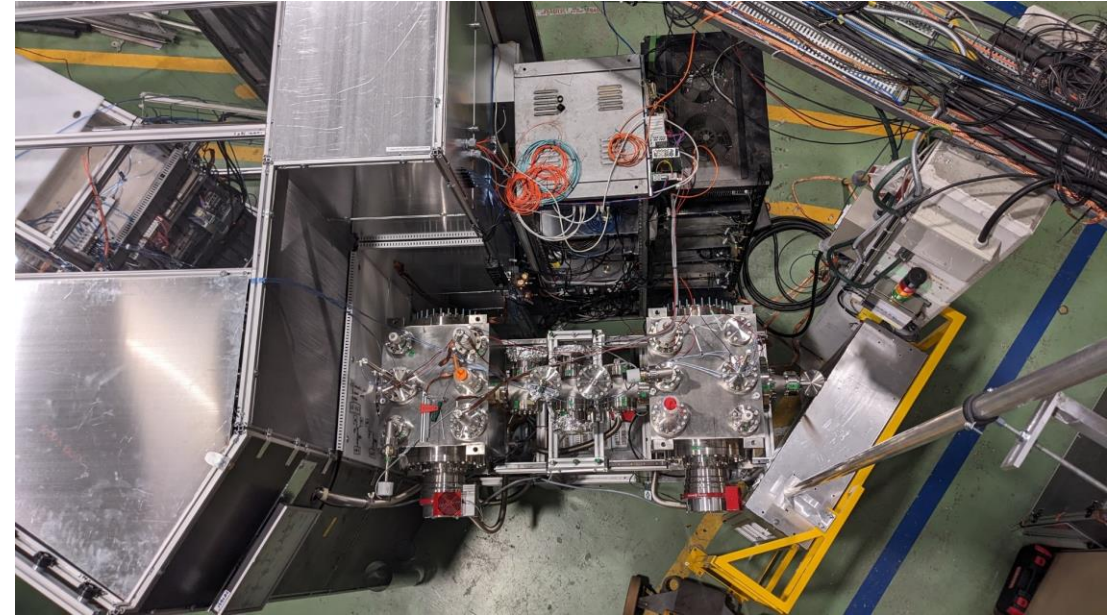
| April |                                  |    | May              |                          |          | June      |           |          | July      |       |         | August |            |       | September |    |    | October |       |       | November |    |    |    |    |    |    |    |    |    |    |    |  |
|-------|----------------------------------|----|------------------|--------------------------|----------|-----------|-----------|----------|-----------|-------|---------|--------|------------|-------|-----------|----|----|---------|-------|-------|----------|----|----|----|----|----|----|----|----|----|----|----|--|
| 14    | 15                               | 16 | 17               | 18                       | 19       | 20        | 21        | 22       | 23        | 24    | 25      | 26     | 27         | 28    | 29        | 30 | 31 | 32      | 33    | 34    | 35       | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 |  |
| TBC   |                                  |    | #791 ThC VDS     | ISOL TRAP                | #816 UC  | Ascension | ISOL TRAP | CRIS     | ISOL TRAP | IS712 | TS 30 h | IS714  | IS714      | IS733 |           |    |    | IS712   | IS712 | IS714 |          |    |    |    |    |    |    |    |    |    |    |    |  |
|       | Time available for tests to CRIS |    | TSD FTS/ISOLTRAP | TSD (days until Weekend) | IS718    |           |           | IS700    | IS700     | IS712 | IS714   | IS714  |            |       |           |    |    |         |       |       |          |    |    |    |    |    |    |    |    |    |    |    |  |
|       |                                  |    |                  |                          | RILIS TI |           |           | RILIS Al |           |       | RaF     | RaF    | RILIS : Cr |       |           |    |    |         |       |       |          |    |    |    |    |    |    |    |    |    |    |    |  |

- 59 scheduled experiments
  - 10 HIE-ISOLDE experiments
- 470 shifts for physics and beam development
  - 122 HIE-ISOLDE shifts
- Most runs were at least partly successful (few issues from machine and target side but also from experimental side)
- Busy Winter Physics programme, 3 targets were irradiated cold October + external Ag sample from PSI

# Feedback from runs

## MIRACLS

- New MIRACLS setup fully operational for the first time
- Trap ions in MR-ToF for 16 revolutions
- First CLS spectra of  $^{26}\text{Mg}$  from ISOLDE



# Feedback from runs

## CRIS

### Setup

- Upgrade of the end of the beam line: beam transport efficiency toward the ion and particle detectors improved by a factor 4.
- Installation and commissioning of the CRIS decay spectroscopy station: tape system synchronised with lasers and ion release. Allows to perform decay assisted laser spectroscopy and decay spectroscopy with isometrically purified beams. System commissioned successfully with  $^{75}\text{Zn}$  during the Zn beam time.

### Physics

- High res. 29-34Al, charge radii across  $N=20$  in the island of inversion
- High res. 80,81,82Zn, Charge radii across  $N=50$  and moments of  $N=51$  in the vicinity of  $^{78}\text{Ni}$
- High res. 50-62Cr. Charge radii and moments from  $N=28$  to  $N=40$  entering the  $N=40$  island of inversion
- Low res of  $^{221}\text{Fr}$ . New states discovered. Successful preparation of the 2024 run.
- Low and high res. of  $^{226,225}\text{RaF}$ . New state discovered. Pin down the rotational constants of  $^{225}\text{RaF}$  (maybe more in the next few days!)



# Feedback from runs

Three very successful experiments in 2023!

Sensitivity limit pushed down to less than 40 ions/s and 25MHz resolution

## IS 529 Laser spectroscopy of very exotic Ca isotopes

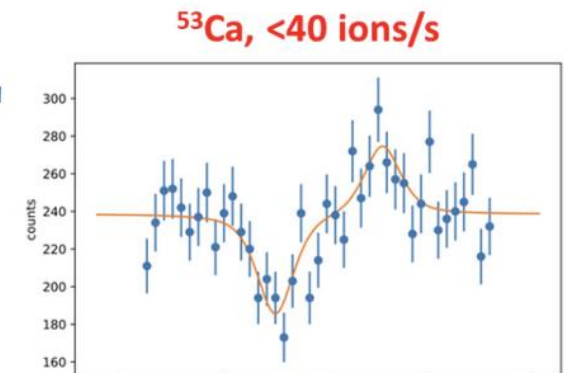
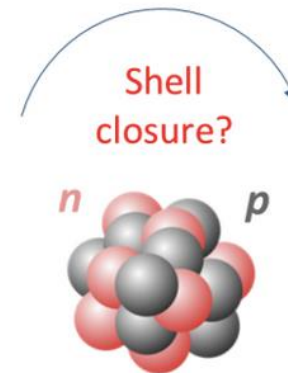
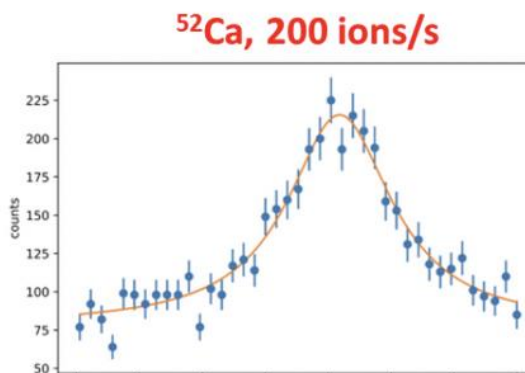
- ✓ Spectroscopy on Ca isotopes with less than 40 ions/s using the recently developed ROC setup.
- ✓ Hyperfine structure and isotope shift of  $^{53}\text{Ca}$  measured for the very first time.

## Lol 245 Towards the proton emitter nuclei $^{147}\text{Tm}$

- ✓ Hyperfine structures and isotope shifts of more than 20 isotopes and 10 isomers measured.
- ✓ Two new isomeric states discovered.
- ✓ Very high-precision data with less than 25MHz resolution.

## IS 718 Laser spectroscopy of neutron rich Tl isotopes

- ✓ Hyperfine structures and isotope shifts of more than 25 isotopes and 15 isomers measured.
- ✓ Nuclear properties of more than 15 isotopes measured for the very first time.





# Feedback from runs

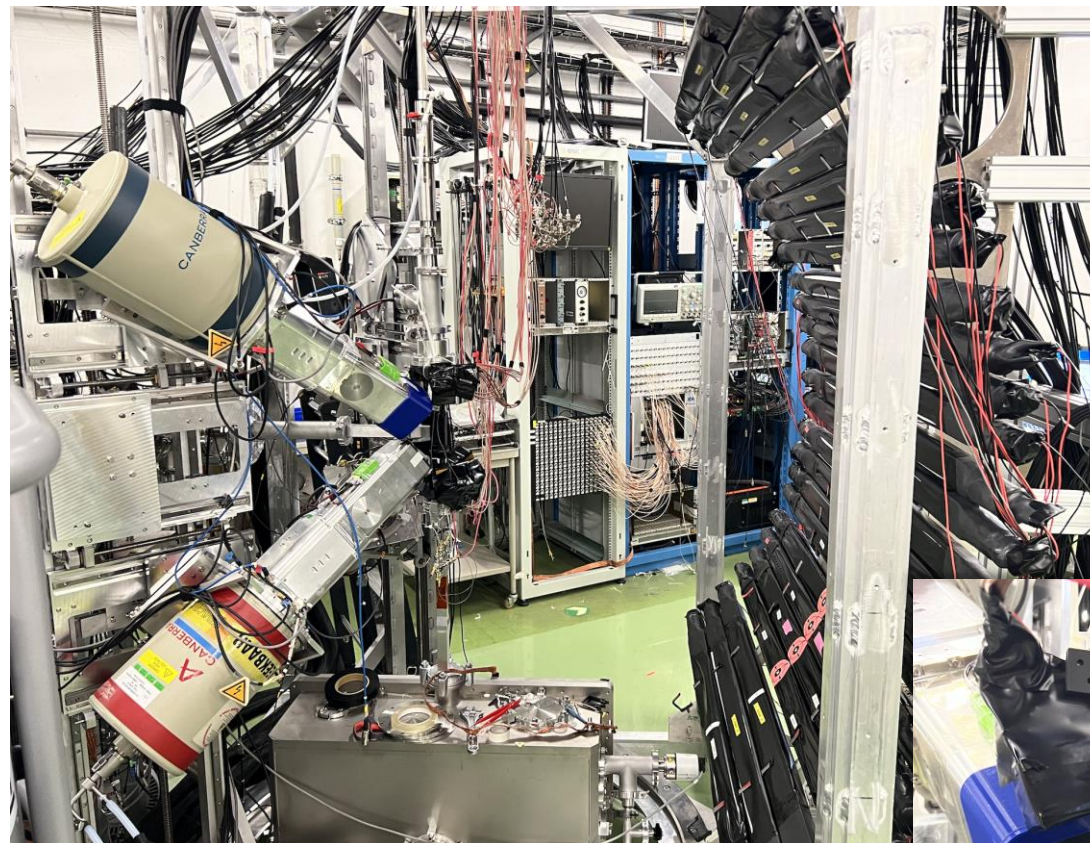
## IDS

### Test run for IS702

- $^{132-135}\text{In}$  neutron decay measurements
- Setup
  - Installation of 6 new OGS detectors
    - Low-energy neutrons + higher efficiency
  - INDiE bars
  - 4 clovers for gammas and 3 beta detectors

Ad-hoc  $^{29-31}\text{Na}$  experiment as VITO replacement

Ready for neutron spectroscopy campaign next year!



# Feedback from runs

## SSP

- Successful commissioning of **MULTIPAC setup** (currently installed in b. 275):
  - Hardware is fully operational, including detectors
  - Good energy resolution (2.8% for  $^{60}\text{Co}$ )
  - At the moment, poor time resolution (10 ns), working on improvements to reach 220 ps
    - Limited to simple magnetic elements so far

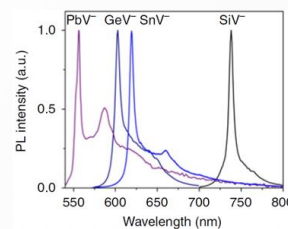
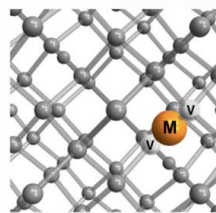
→ Ready for online installation in 2024
- Tested new emission Mossbauer setup

# Feedback from runs

## $^{209}\text{Pb}$ emission channeling identification of PbV colour centers in diamond

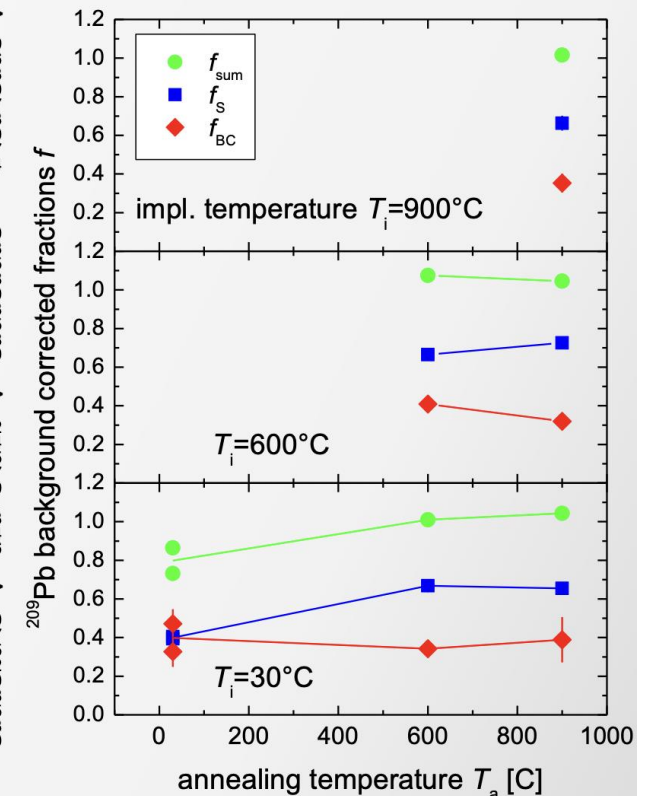
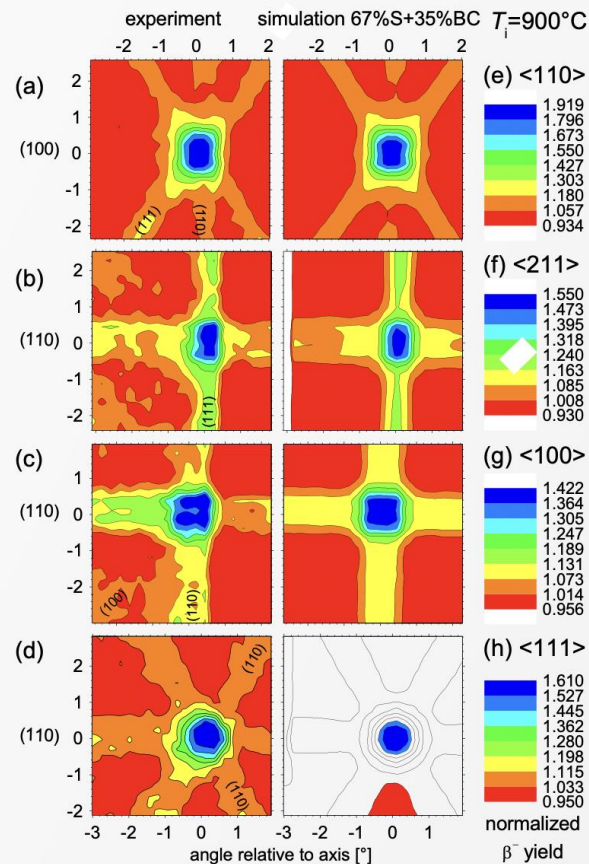
SSP

- PbV<sup>-</sup> is one of the group IV-vacancy complexes in diamond which are promising for applications in quantum information processing [1]



[1] C. Bradac *et al.*, "Quantum nanophotonics with group IV defects in diamond", Nature Comm. 10 (2019) 5625

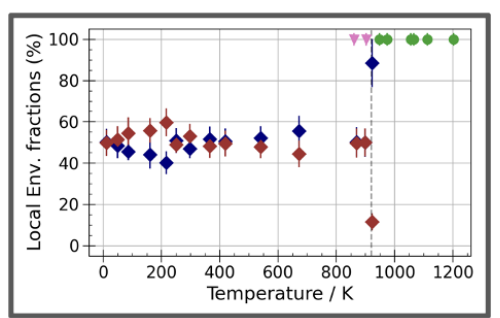
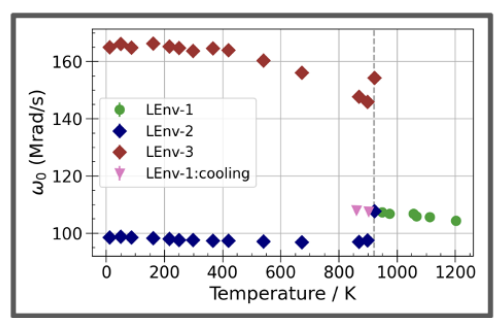
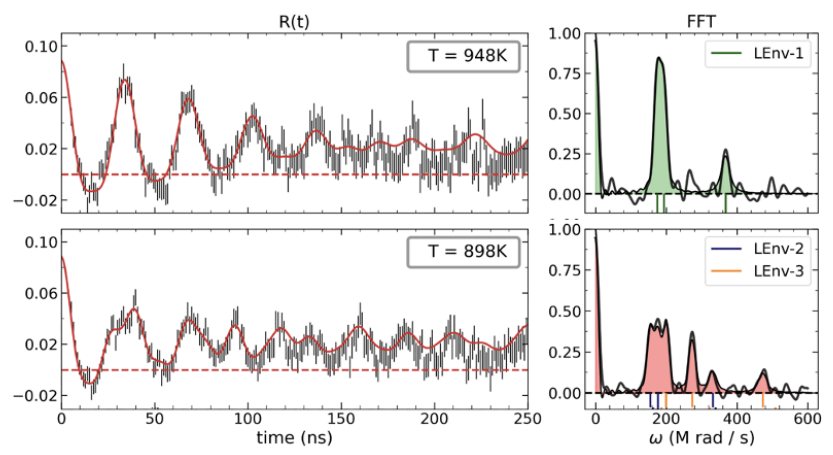
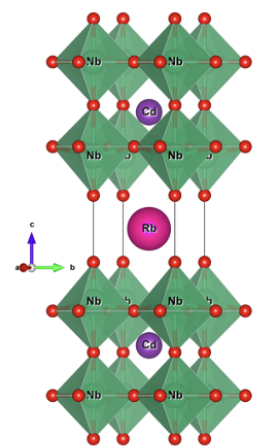
- First emission channeling lattice location experiments using  $^{209}\text{Pb}$  ( $t_{1/2}=3.25\text{h}$ ) in diamond
- Implantations and annealings up to  $900^\circ\text{C}$  identified 35-40% of  $^{209}\text{Pb}$  on bond-center (BC) sites in split-vacancy complexes.
- ⇒ **High structural formation yield and high thermal stability of PbV against thermal annealing**
- However, reported *optically active* formation yield [1] is only  $\sim 2\%$ . Why? PbV not in correct charge state?



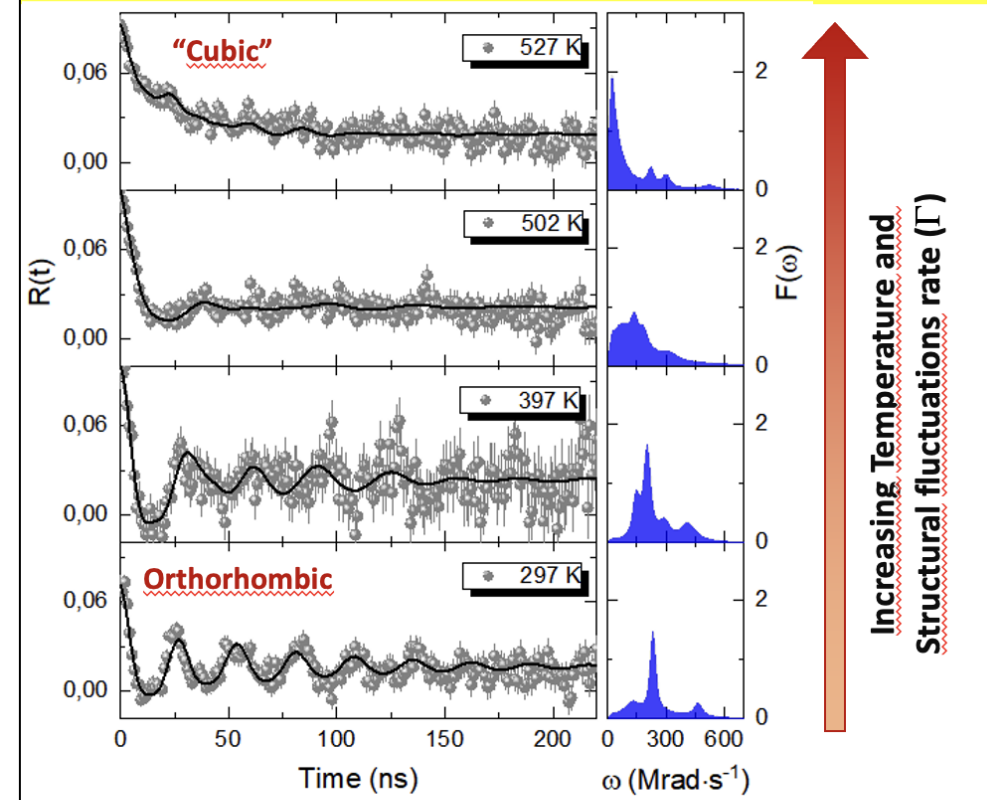
# Feedback from runs

IS738  $^{111}\text{mCd}$  Microscopic insight by nuclear hyperfine methods on ferroic Perovskites

IS730 -  $^{111}\text{mCd}$  Perturbed Angular Correlation (PAC) Study of Dynamic Order-Disorder Structural transitions in Halide and Oxide Perovskite Systems



## R(t) Functions across the Structural transition from the Orthorhombic to the Cubic Structure: $\text{PbZrO}_3$ case study

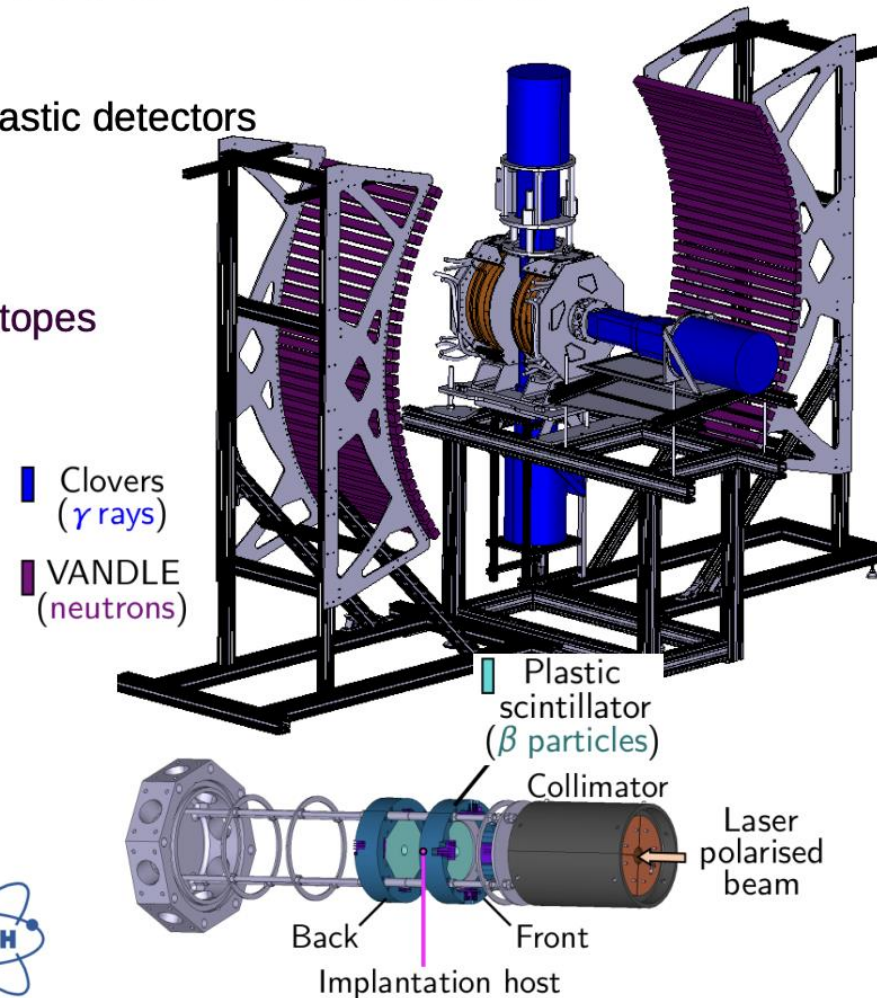
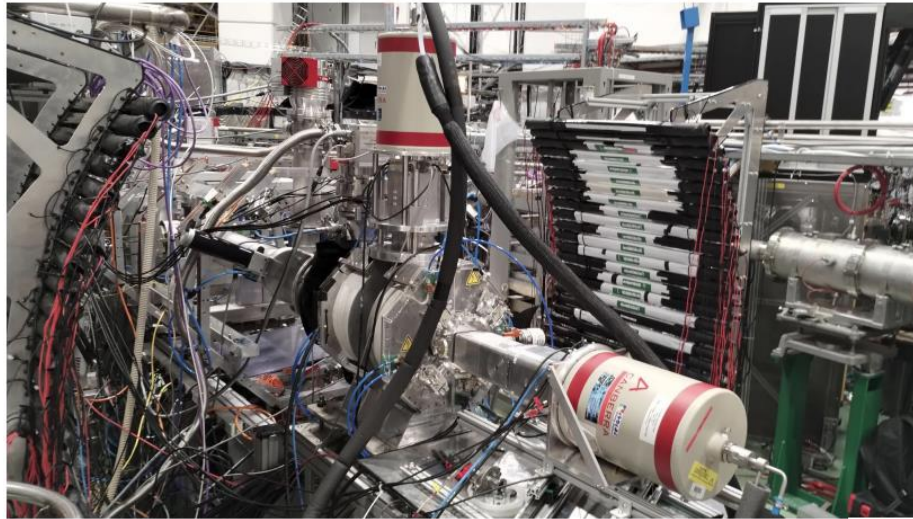


new 1<sup>st</sup> order phase transition at 920K

# Feedback from runs

## New end station at VITO – DeVITO

- $\beta$ -decay spectroscopy with laser-polarised beams
- Detection setup: 3x Clovers, 2x VANDLE *tof* arrays, 2x plastic detectors
- DAQ: XIA PIXIE-16 (160 channels used)
- New compact magnet and implantation system
- Successfully commissioned in July 2023 with n-rich K isotopes



# Feedback from runs since last ISCC

## ISOLDE Solenoidal Spectrometer

- 3 successful runs

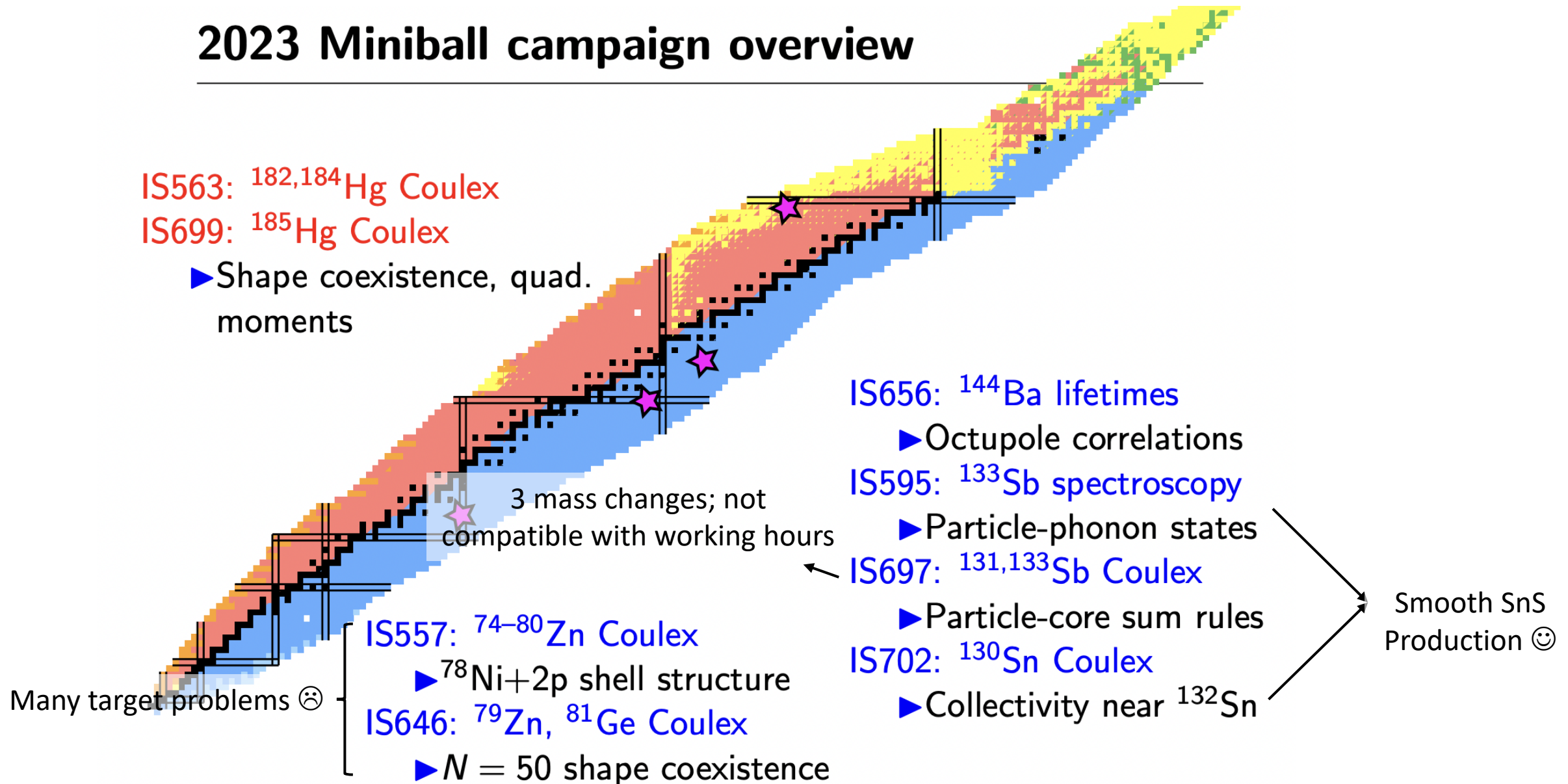
### IS692

- ${}^7\text{Be}(d,p)$  @ 11 MeV/A to populate high-lying rotational bands in  ${}^8\text{Be}$
- *“ISOLDE is the only facility that can provide the necessary yield and energy”* → Happy users
- Winter Physics (less influence of  ${}^7\text{Li}$  contamination)

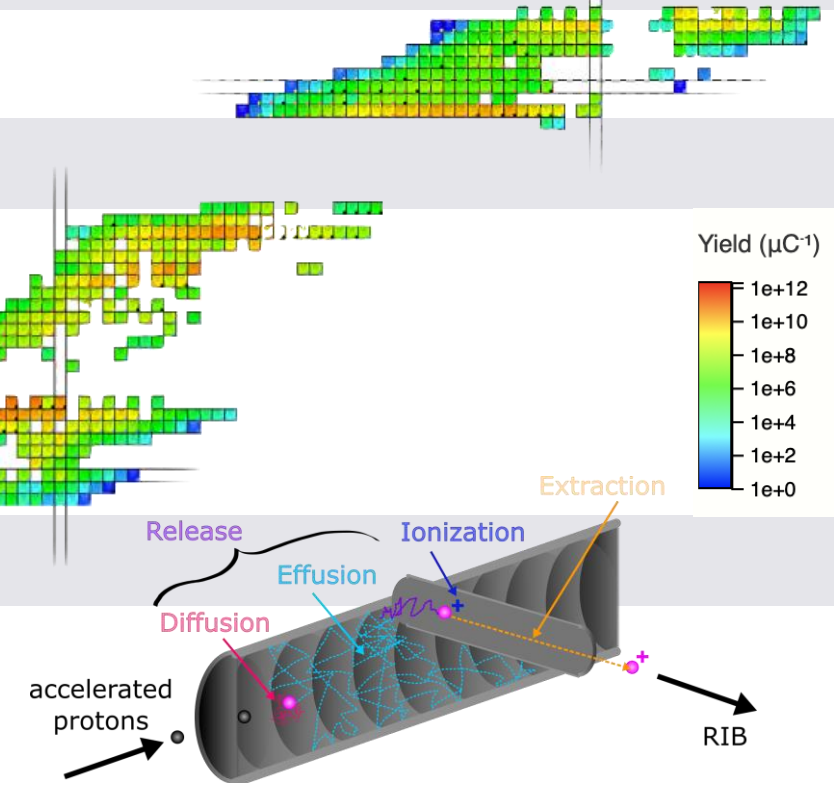
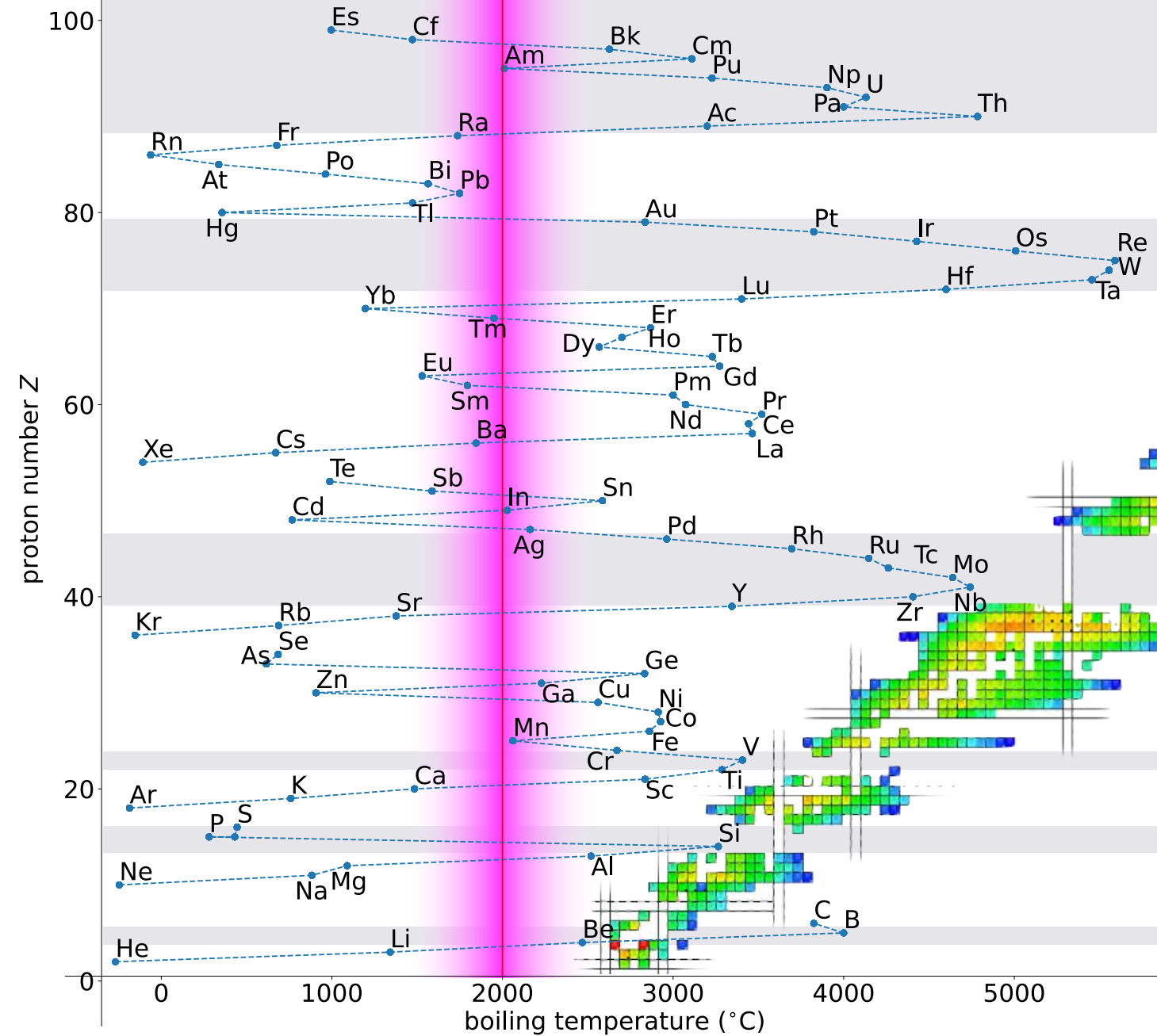


# Feedback from runs

## 2023 Miniball campaign overview



# TISD challenges



1. Refractory properties
2. Contamination
3. Yield and purity



# TISD 2023

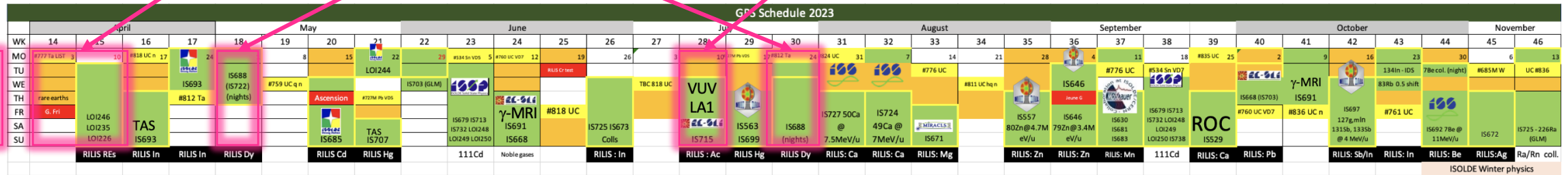
LIST: actinides

LIST: lanthanides

Back-of-line heating:  
Dy collections

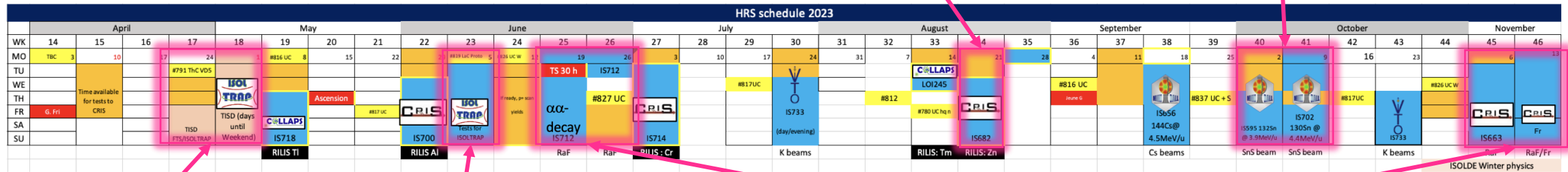
Batch mode: Ra → Ac

Yield measurements,  
proton scans, setup



Prototype hot quartz: CRIS Zn

SnS



ThC<sub>x</sub> VD5+CF<sub>4</sub>

Prototype target +  
prototype ion source:  
ISOLTRAP Cd

RaF online + winter physics  
now standard beam

# TISD highlights

## New elements

- Np, Pu

## New molecules

- $\text{AcF}_x$

## New targets and ion sources

- Thermal screening
- Back-of-line heating
- LIST


Production of neptunium and plutonium nuclides from uranium carbide using 1.4-GeV protons

M. Au, M. Athanasakis-Kaklamanakis, L. Nies, R. Heinke, K. Chrysalidis, U. Köster, P. Kunz, B. Marsh, M. Mougeot, L. Schweikhard, S. Stegemann, Y. Vila Gracia, Ch. E. Düllmann, and S. Rothe  
Phys. Rev. C **107**, 064604 – Published 8 June 2023

1 **Production and purification of molecular  $^{225}\text{Ac}$  for medical**  
2 **applications**

3 M. Au,<sup>1,2,\*</sup> L. Nies,<sup>1</sup> S. Stegemann,<sup>1,3</sup> M. Athanasakis-Kaklamanakis,<sup>1,4</sup>  
4 T.E. Cocolios,<sup>4</sup> P. Fischer,<sup>3</sup> P.F. Giesel,<sup>3</sup> J. Johnson,<sup>4</sup> U. Köster,<sup>1,5</sup> D. Lange,<sup>6</sup>  
5 M. Mougeot,<sup>1,6,†</sup> J. Reilly,<sup>7</sup> M. Schlaich,<sup>8</sup> Ch. Schweiger,<sup>1,6</sup> L. Schweikhard,<sup>3</sup>  
6 F. Wienholtz,<sup>8</sup> W. Wojtaczka,<sup>4</sup> Ch. E. Düllmann,<sup>2,9,10</sup> and S. Rothe<sup>1</sup>

In preparation

 Nuclear Instruments and Methods in Physics  
Research Section B: Beam Interactions with  
Materials and Atoms  
Volume 542, September 2023, Pages 38-44

### Targets and ion sources at CERN-ISOLDE – Facilities and developments

S. Rothe<sup>a</sup>, M. Au<sup>a,b</sup>, J. Ballof<sup>a,b</sup>, E. Barbero<sup>a</sup>, M. Bissell<sup>a</sup>, A. Boucherie<sup>a</sup>, M. Bovigny<sup>a</sup>,  
K. Chrysalidis<sup>a</sup>, B. Crepieux<sup>a</sup>, J. Cruikshank<sup>a</sup>, E. Fadakis<sup>a</sup>, R. Heinke<sup>a</sup>, F. Josa<sup>a</sup>, L. Le<sup>a</sup>,  
A. Koliatos<sup>a</sup>, E. Piselli<sup>a</sup>, E. Reis<sup>a,c</sup>, V. Samothrakis<sup>a</sup>, M. Schütt<sup>a</sup>, L. Lambert<sup>a</sup>, D. Leimbach<sup>a,d</sup>,  
S. Marzari<sup>a</sup>, M. Owen<sup>a</sup>, S. Stegemann<sup>a</sup>, Y.N. Vila Gracia<sup>a</sup>

 Nuclear Instruments and Methods in Physics  
Research Section B: Beam Interactions with  
Materials and Atoms  
Volume 541, August 2023, Pages 8-12

### First on-line application of the high- resolution spectroscopy laser ion source PI-LIST at ISOLDE

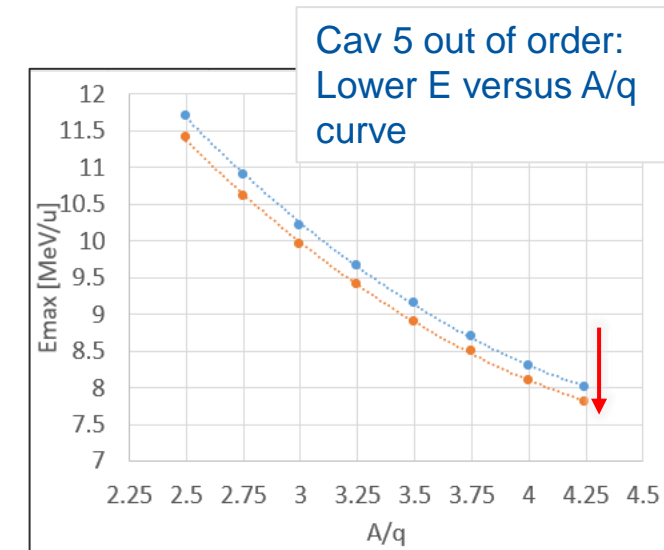
Reinhard Heinke<sup>a</sup>, Mia Au<sup>a,b</sup>, Cyril Bernerd<sup>a,c</sup>, Katerina Chrysalidis<sup>a</sup>,  
Thomas E. Cocolios<sup>c</sup>, Valentin N. Fedosseev<sup>a</sup>, Isabel Hendriks<sup>a,d</sup>, Asor A.H. Jaradat<sup>a</sup>,  
Magdalena Kaja<sup>e</sup>, Tom Kieck<sup>f,g</sup>, Tobias Kron<sup>e</sup>, Ralitsa Mancheva<sup>a,c</sup>, Bruce A. Marsh<sup>a</sup>,  
Stefano Marzari<sup>a</sup>, Sebastian Raeder<sup>f,g</sup>, Sebastian Rothe<sup>a</sup>, Dominik Studer<sup>f,g</sup>, Felix Weber<sup>e</sup>,  
Klaus Wendt<sup>e</sup>

# REX/HIE-ISOLDE issues

- Issues with nearly all aspects of the post-accelerator
  - REX low energy
  - REX NC linac
  - HIE SC Linac
    - Problems with CM1 (cavity 2 and 5)
  - Cryo
- Close to zero commissioning time → no reference files → part of setting up machine
- **Planned experiments could be maintained**
- Machine development
  - Investigation of using ISCOOL instead of REXTRAP in case of failure → seems promising
  - New methods of rephasing the HIE LINAC in case of a failing or running at reduced gradient SRF cavity → reduce necessary rephasing time in case of issues (days → hours)
  - Test to see if it is possible to run without CM1



9GAP vacuum leak: tightening the bolts



Additional slides

# YETS activities

## ISOLDE primary areas

- Targets removal from the target area
- Yearly maintenance of the two Frontends and handling systems
- Consolidation of systems for targets coupling and un-coupling (several issues this year)
- Replacement of HRSFC0600 Faraday Cup Scanner (mostly unused in '23 due to vacuum leak)
- Exchange of beam dumps thermo-couples
- Replacement of the two 30 years old SEMGRIDs in the proton beam lines (just before the targets)
- BTY line survey (alignment checks) between the PS Booster side and ISOLDE target area.
- Installation of fire detection in the GPS and HRS separator zones (interfaced to fire doors).
- Installation of fan coil units to regulate the temperature in the HRS separator area (above 40 degree due to equipment thermal load and absence of fresh air supply).

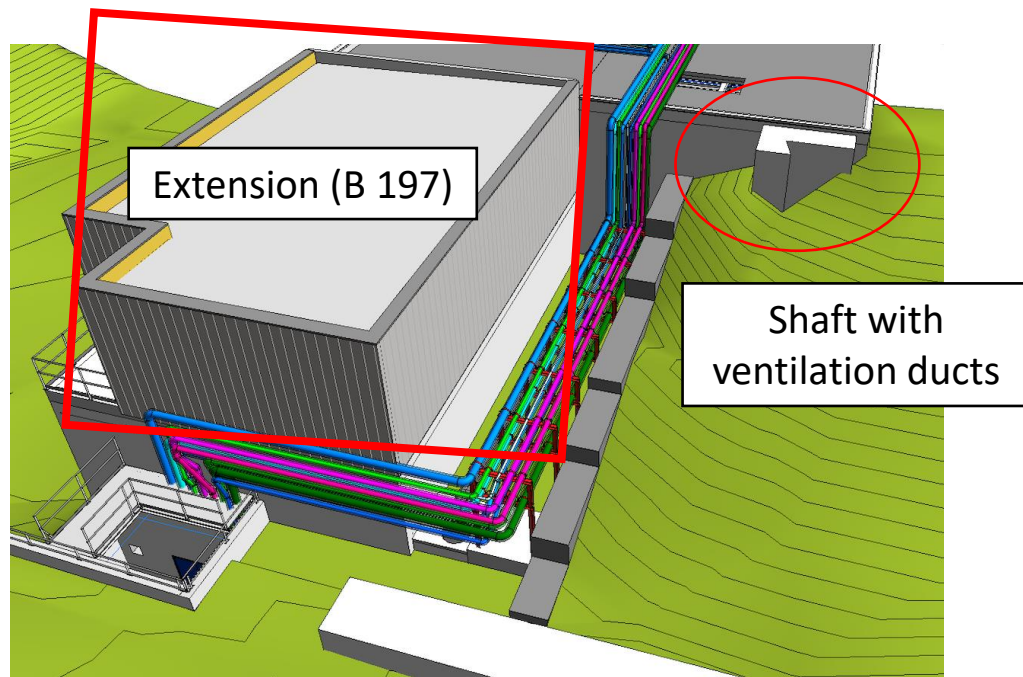
## HIE-ISOLDE

- 6 Nov: End of HIE (winter) Physics
- 6 Nov – 1 Dec: HIE warm-up period including tests on the feasibility of a GHe or LN2 system to keep th CM's shields <100K during a compressor station stop
- 4 Dec: (HIE) ISOLDE full stop
- 19<sup>th</sup> February 2024: Start of HIE ISOLDE HW Commissioning
- 26 Feb: All cooling water back
- 20 March – 24 April: Cyro Modules cooldown period
- 25 April – 16 May: SRF reconditioning at 4.5K
- 1 May: REXTRAP, REXEBIS & REX (RF) LINAC ready for Beam Commissioning
- 1 May – 11 July: REX/HIE Machine Check out and Beam Commissioning
- 13<sup>th</sup> May 2024: Start of HIE-ISOLDE Beam Commissioning
- 21<sup>st</sup> June 2024: HIE ISOLDE stable beam to exp. Stations
- 11<sup>th</sup> July 2024: Start of HIE ISOLDE Physics

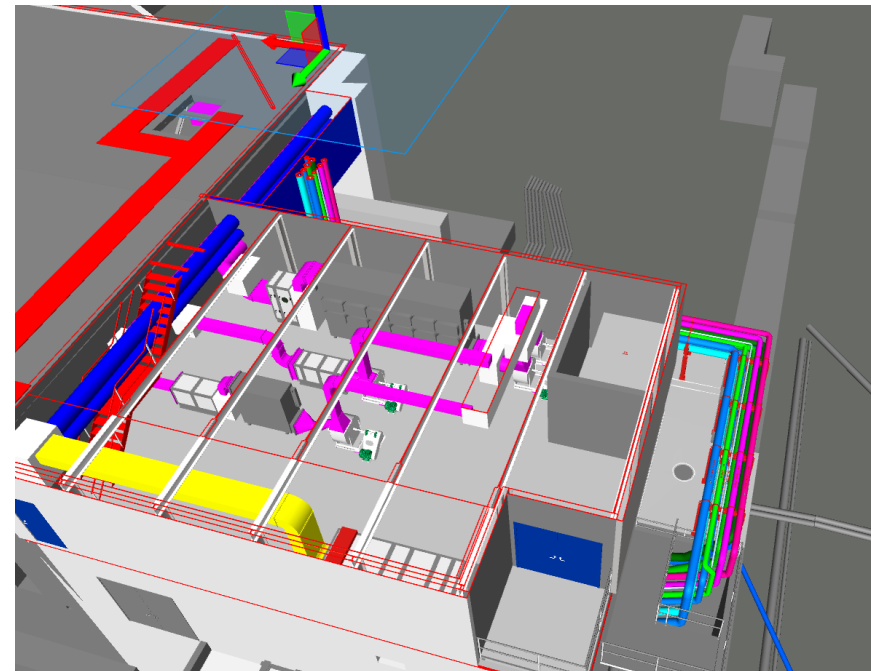
# Preparatory work for Building 197 extension

- Building 197 extension required close to the existing ventilation technical room (B.170 – 3-402) to modernize (safety) and upgrade the primary areas ventilation (fire dampers, charcoal filters...)
- Work started on the 30/10 (just after the proton beam stop) and services running along the Building 197 will be relocated during the YETS to allow the building construction to start in 2024 in parallel to operation

**Future extension**



**Preliminary integration of ventilation equipment  
Inside the new building**



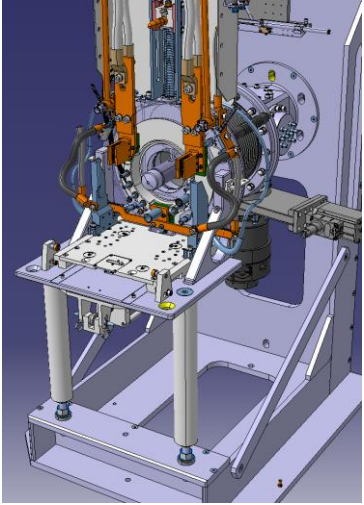
# Worksite (situation on the 06/11/2023)

- Soil removal has started to construct a new wall and concrete slab which will host a supporting structure for the different services currently running along Building 197
- The chiller currently on top of Building 197 will be moved to the roof of the Building 199 during during the YETS
- Final connection of the ventilation to the new process equipment will take place during LS3

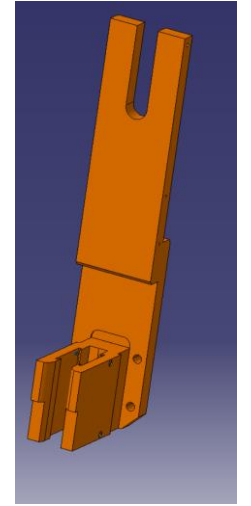
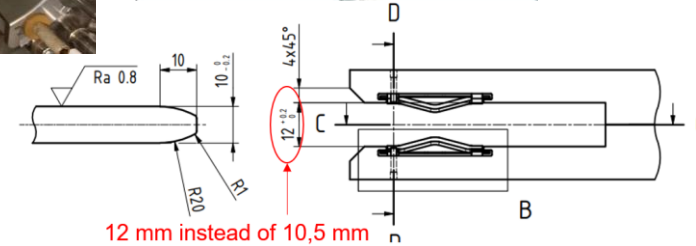
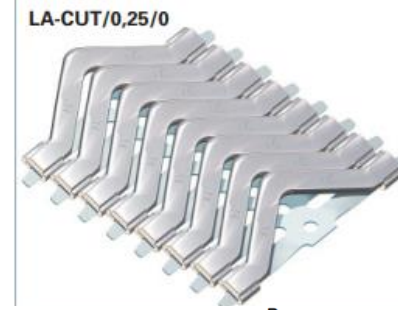


# YETS activities: targets coupling

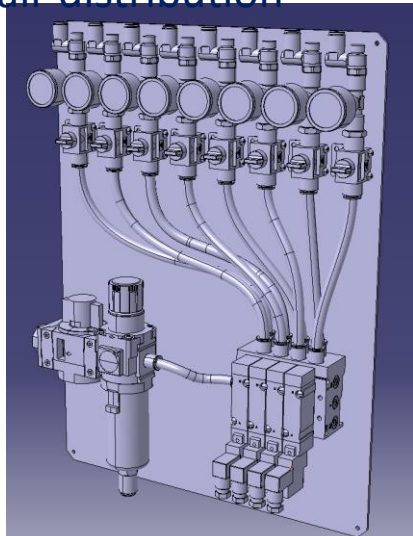
## Improved Rad-Hard piston design (reliability)



## New Multicontact for main power connectors (more elastic, less friction...)



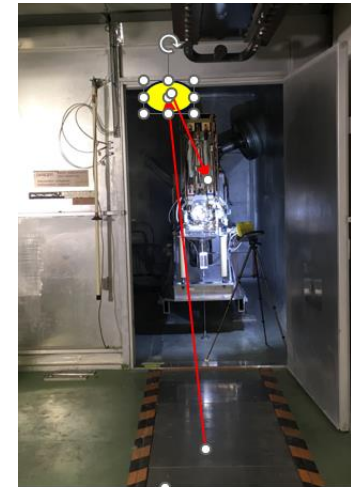
## Improved compressed air distribution



## Improved visualization



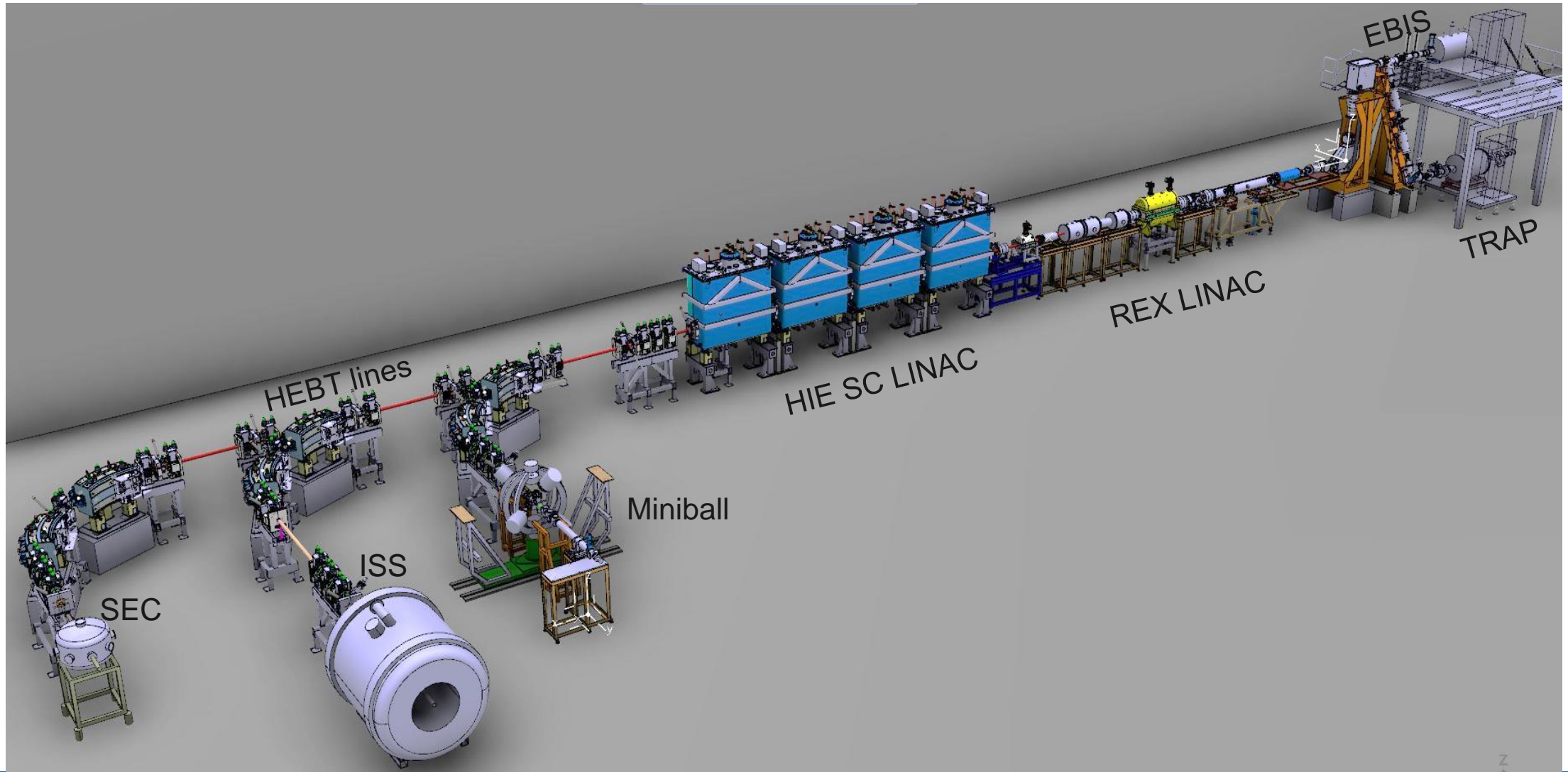
Like in MEDICIS bunker



Telescopic camera

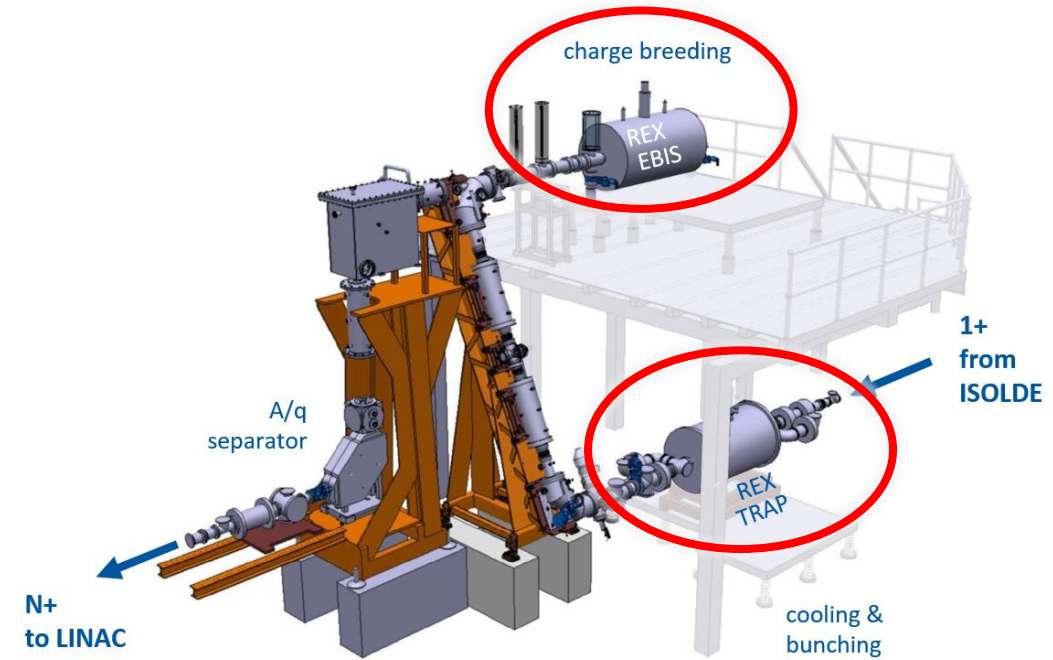


# Status of REX/HIE ISOLDE and YETS activities:



# REX Low Energy:

- REXTRAP:
  - During the recommissioning in June issues with the REXTRAP efficiency worsened. It was opened up by F. Wenander & team (ABP). The trap was available again for beam commissioning in July.
- REXEBIS:
  - Last year's severe issues with LHe boil off and quenches were addressed during the YETS by a complete EBIS dis- and reassembly. A serious mechanical issue occurred during work on the inner drift-tube. A swift crash repair was carried out so that the EBIS was available in time end of May for the beam commissioning of REX by OP.
  - The work on EBIS paid off and it has been running well during the '23 run.

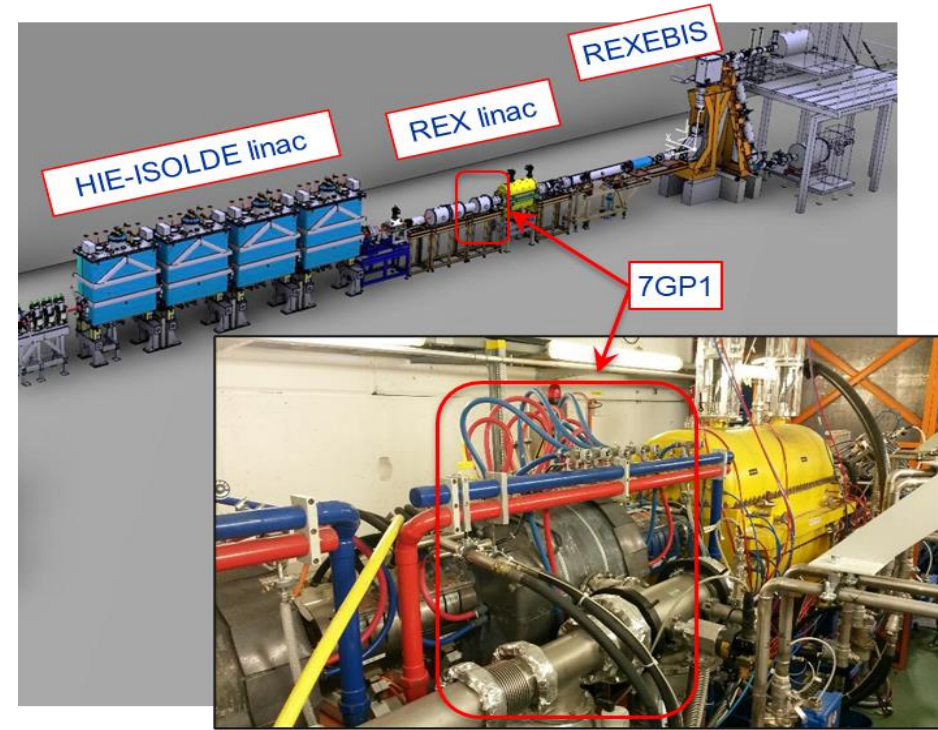


# REX NC LINAC:

- REX LINAC:

Several issues with REX RF during the recommissioning:

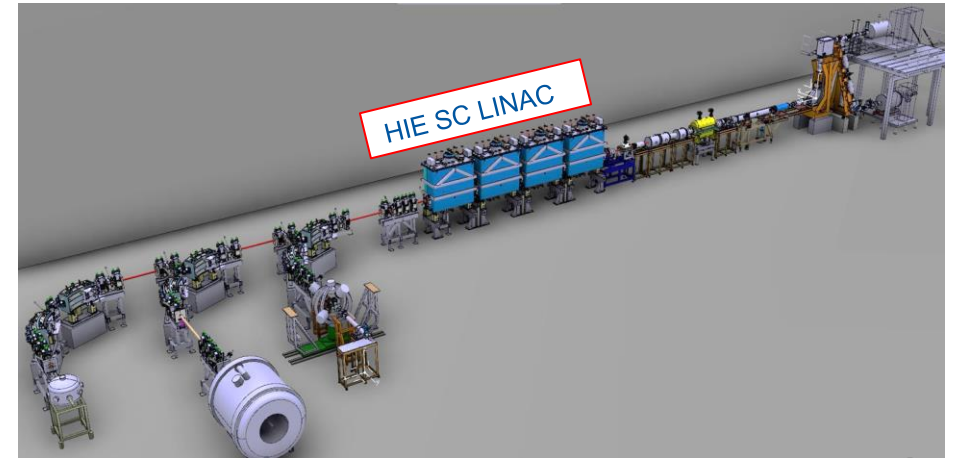
- Tuner of the REX Buncher overheating: cooling water problem has been addressed.
- 7GAP1 last years instabilities were still there and not completely understood. A permanent Seismic measurement system has been installed to observe possible vibrations. The 7GAP1 instabilities limit the  $A/q$  (from 4.5) to 4.25. (No significant or explaining vibrations have been observed throughout the year).
- 7GAP1 and 7GAP3 amplifier issues were addressed
- 9GAP developed a serious vacuum leak in April which has been addressed by tightening the bolts of the structure.



REX 9GAP vacuum leak: tightening the bolts

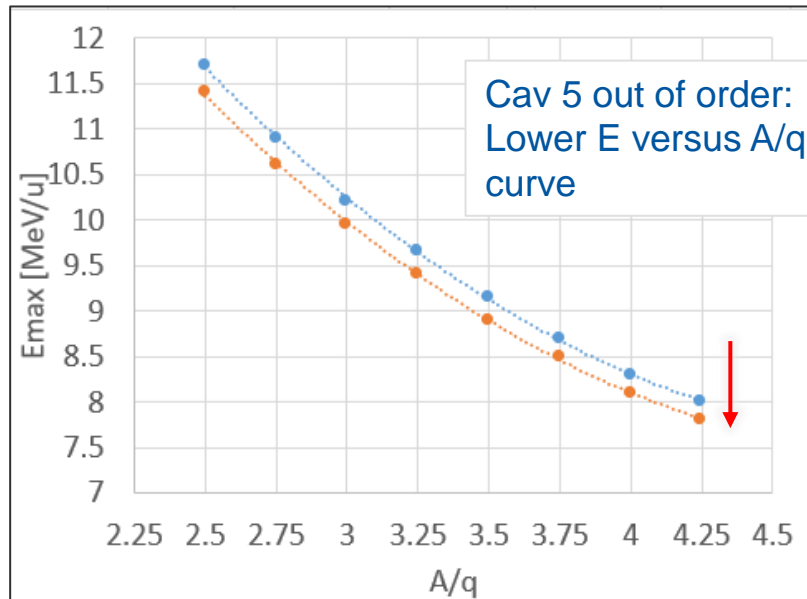
# HIE SC LINAC:

- In June Cavity 5 in CM1 (XLL2) quenched. Assumed pollution on the Nb layer.
- The total gradient efficiency reduced from 79% (May '23) to 76% (91.8 out of 120 MV/m).
- Cavity 2 in CM1 caused issues later during the run reducing the total gradient further.
- To reach maximum HIE energy at the end of the run, Cavity 2 and 5 were put back in action, the latter at reduced gradient



79% -> 76%

| A/q  | Emax [MeV] | Emax [MeV/u] |
|------|------------|--------------|
| 2.5  | 11.7       | 11.4         |
| 2.75 | 10.9       | 10.6         |
| 3    | 10.2       | 9.95         |
| 3.25 | 9.65       | 9.4          |
| 3.5  | 9.15       | 8.9          |
| 3.75 | 8.7        | 8.5          |
| 4    | 8.3        | 8.1          |
| 4.25 | 8          | 7.8          |

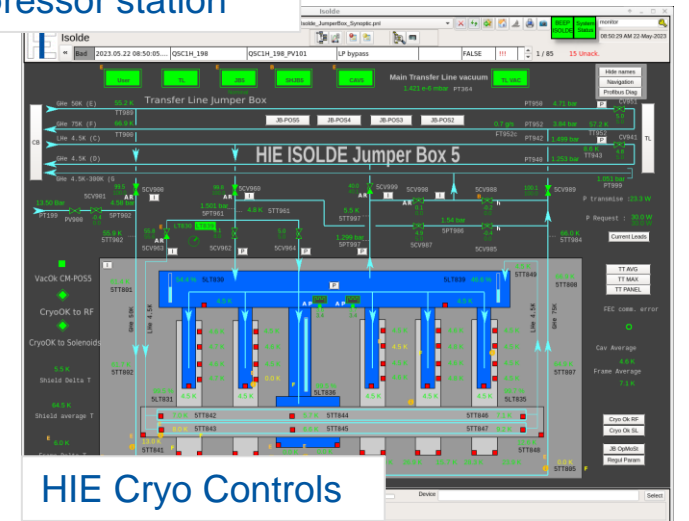


# HIE Cryo issues:

- A power cut end of June took down the cryo plant and introduced pollution in the Coldbox which limited the cooling power making it hard to keep the Cryo Modules' thermal shields at nominal temperatures.
- Another unplanned power cut in September was used by the cryo team to replace a failing heat exchanger on the compressor gearbox.  
A very positive effect was that at the restart of the plant the process unclogged the Coldbox from its pollution and nominal cooling power was back again.



HIE Cryo Compressor station



HIE Cryo Controls

## Operations:

- The severe issues with REX during the restart reduced the Beam Commissioning severely. Despite, first stable beam to ISS (6th July) and first physics at Miniball (19 July) could be maintained.
- The reduced time for Beam Commissioning played up throughout the whole run: No reference files could be done and became part of the setting up of the various experiments.
- Despite many issues throughout the year, HIE ISOLDE managed to deliver beam according to schedule and physics requests.

Some promising MDs could be carried out towards the end of the ‘:

REX Low Energy:

- ISCOOL buncher / EBIS efficiency tests by F. Wenander: Proof of principal: triggered by EBIS the ISCOOL can send bunches through the TRAP in ‘fly-through’ mode. This could open the way to replace the TRAP solenoid by a doublet in case of a serious TRAP failure.

HIE Linac:

- New methods of rephasing the HIE LINAC in case of a failing or running at reduced gradient SRF cavity were tested successfully by OP. This might significantly reduce the painstaking time to rephase cavities in case of issues.

# YETS '23-'24 key-dates:

- 6 Nov: End of HIE (winter) Physics
- 6 Nov – 1 Dec: HIE warm-up period including tests on the feasibility of a GHe or LN2 system to keep the CM's shields <100K during a compressor station stop
- 4 Dec: (HIE) ISOLDE full stop
- 19<sup>th</sup> February 2024: Start of HIE ISOLDE HW Commissioning
- 26 Feb: All cooling water back
- 20 March – 24 April: Cyro Modules cooldown period
- 25 April – 16 May: SRF reconditioning at 4.5K
- 1 May: REXTRAP, REXEBIS & REX (RF) LINAC ready for Beam Commissioning
- 1 May – 11 July: REX/HIE Machine Check out and Beam Commissioning
- 13<sup>th</sup> May 2024: Start of HIE-ISOLDE Beam Commissioning
- 21<sup>st</sup> June 2024: HIE ISOLDE stable beam to exp. Stations
- 11<sup>th</sup> July 2024: Start of HIE ISOLDE Physics

The image displays two Gantt charts detailing the project schedule for HIE ISOLDE. The top chart, titled 'HIE ISOLDE Winter physics', shows tasks from late 2023 to early 2024, including 'Fire Detection tests (3 days)', 'Warm-up Procedure Cts', and 'ISOLDE Winter physics'. The bottom chart, titled 'REXTRAP shutdown preparations', shows tasks from early 2024 to mid-2024, including 'RF feedback tests', 'Beam Permit signed', 'Survey activities', and 'REXTRAP shutdown preparations'. Both charts include columns for task name, duration, start/end dates, and responsible personnel.

