

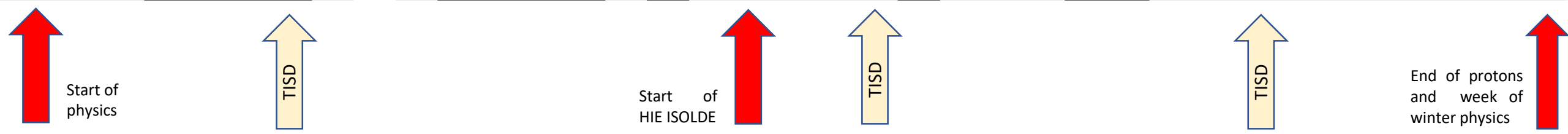
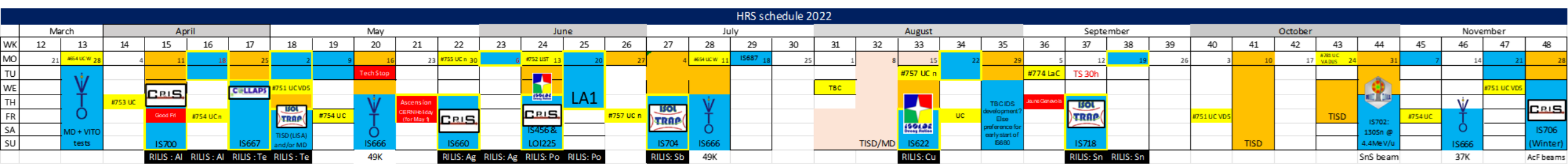
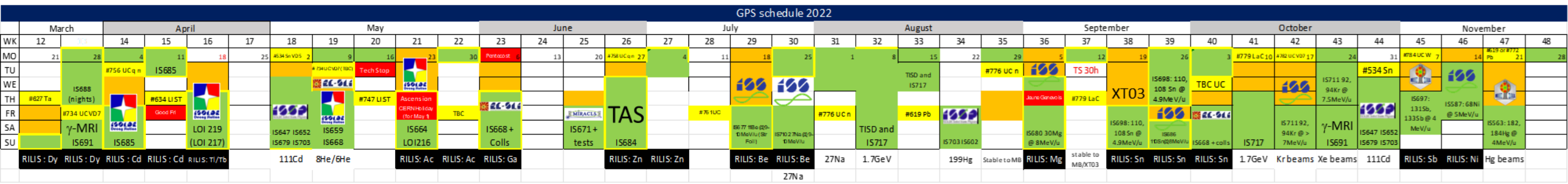


ISOLDE technical and physics report: INTC 72

- Summary of physics run 2022
- 2023 technical works
- 2023 schedule planning
- Update on new setups

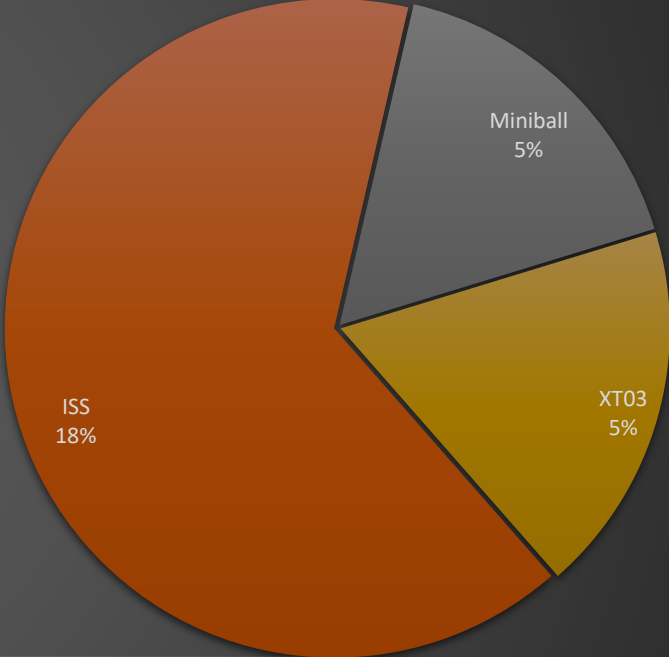
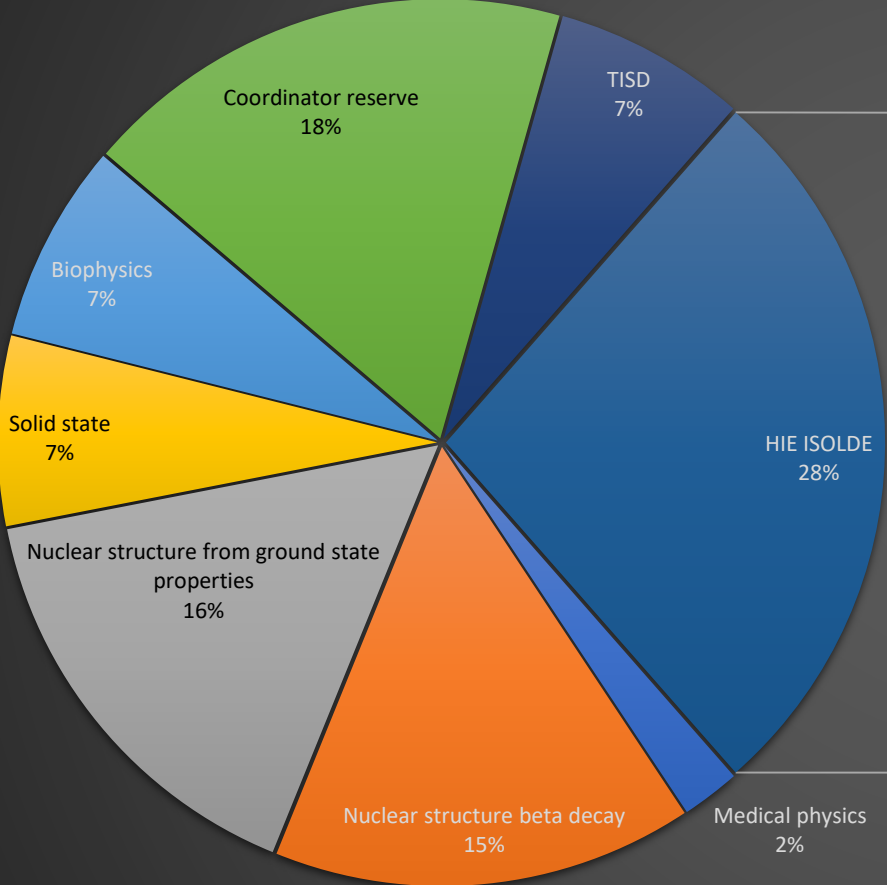
Karl Johnston, with material from Joachim Voltaire and Erwin Siesling

ISOLDE schedule 2022



- ISOLDE started low energy experiments on 28 March as planned
- HIE ISOLDE started on 20th July
- In total 52 experiments were performed, no runs cancelled. 252.33 days available for physics (including winter).
- Delivery of protons ended on 28th November
- One week of winter physics for laser spectroscopy of long-lived radioactive molecules. Finished 5th Dec.
- New in 2022: «regular» blocks for machine development/Target development.
- 465.5 shifts delivered for physics/development.

Beam pie 2022

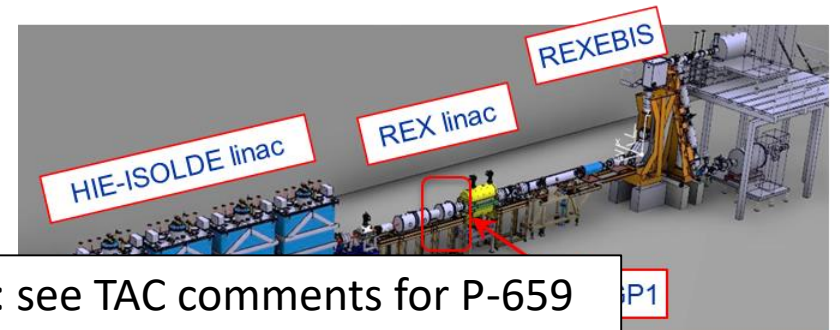


Medical physics Nuclear structure beta decay Nuclear structure from ground state properties Solid state Biophysics Coordinator reserve TISD ISS Miniball XT03

Issues encountered

HIE ISOLDE I

- Cooling in cryoplant was lost 3 times. Cavities required reconditioning delaying commissioning
- Beam commissioning was affected by instabilities in the REX accelerator. 7gap1 was especially problematic. Vibrations suspected and investigated. No cause of vibrations disappeared in June



Limitations due to the 7gap are also affecting new proposals: see TAC comments for P-659

Probing the fission and radiative decay of the $^{235}\text{U}+n$ system using (d, pf) and $(d, p\gamma)$ reactions					
CDS#	Proposal #	IS #	Setup	Shifts	Isotopes
CERN-INTC-2023-019	INTC-P-659		ISS	20	^{235}U

TAC recommendation

The TAC notes that this proposal is compromised by the current performance of the 7gap amplifiers for post accelerated beams. A non-ideal charge state of 56+ is possible but will result in a lower efficiency and should be tested beforehand. Otherwise the proposal seems feasible.

programme for HIE ISOLDE; essentially no time was available before physics.

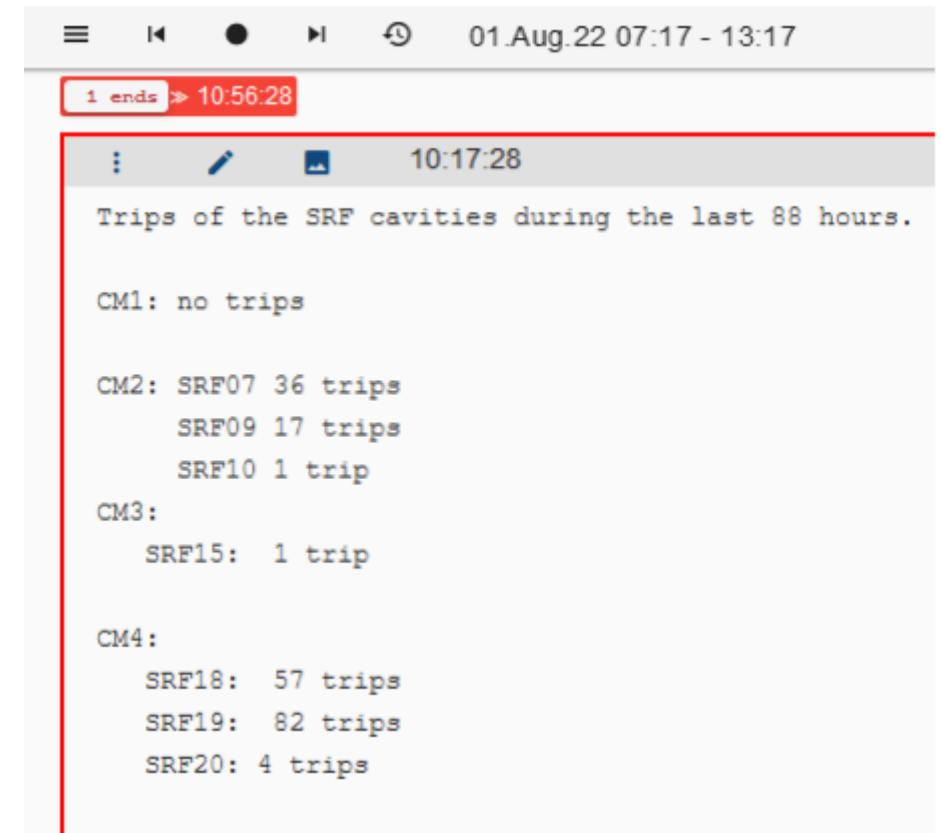
- 7gap3 issue almost cost a physics run just before end of protons.



ISOLDE Superconducting LINAC

Summary of trips from 1st run of HIE ISOLDE in July 2022

- Frequent SRF cavities trips (high sensitivity to vibrations, LHe pressure variations...) and loss of available accelerating gradient after the winter thermal cycle
- Issue being closely followed by RF expert in collaboration with TE-CRG (change in operating parameters of the cryo-plant)
- RF team optimized the cavity sequencer to restart the cavity faster after a trip to reduce downtime.
- Performance from September onwards was better, although some cavities were unusable and remained off.



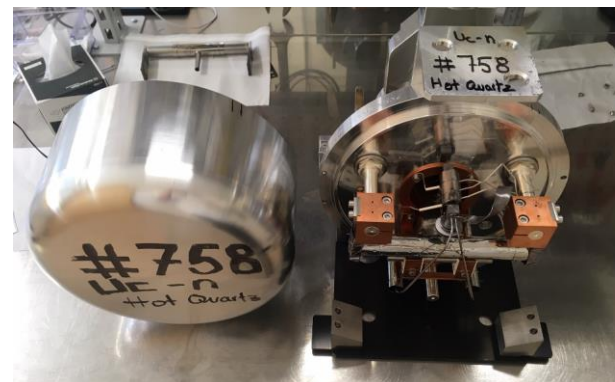
The screenshot shows a terminal window with a title bar indicating the date and time: "01.Aug.22 07:17 - 13:17". A red box highlights the text "1 ends > 10:56:28". Below this, the terminal displays the following text:

```
Trips of the SRF cavities during the last 88 hours.  
  
CM1: no trips  
  
CM2: SRF07 36 trips  
      SRF09 17 trips  
      SRF10 1 trip  
  
CM3:  
      SRF15: 1 trip  
  
CM4:  
      SRF18: 57 trips  
      SRF19: 82 trips  
      SRF20: 4 trips
```

Feedback from the running period

Targets:

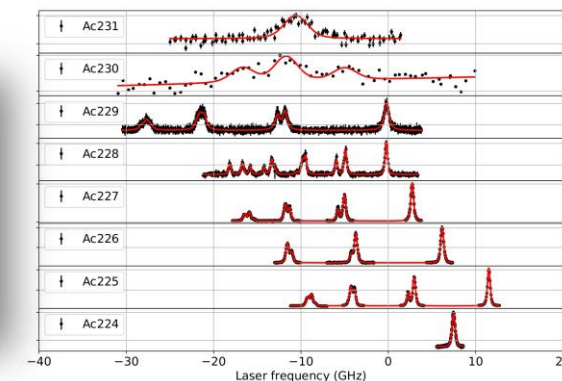
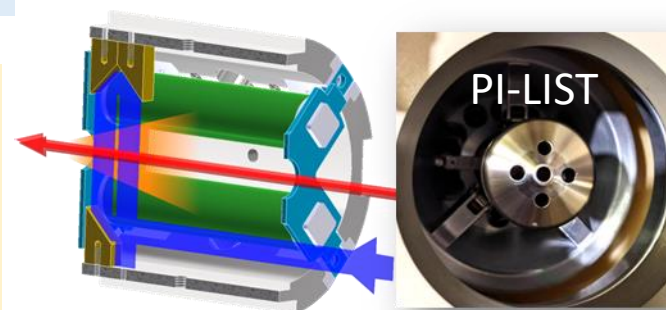
- 24 new units
- Many complex units to meet physics requirements
- Mostly excellent performance, improvements in handling (nanolab) are being seen. Several yields exceeded expectations especially for HIE ISOLDE physics.
- 3 Online failures (1 leak and 2 ion sources), but reliability has been good.
- Reusing targets for less exotic isotopes is increasingly accepted, and successful



Target with «hot quartz» ion source: a complex ion source to suppress contaminants.

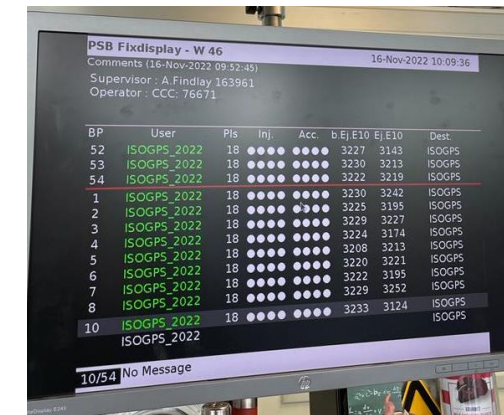
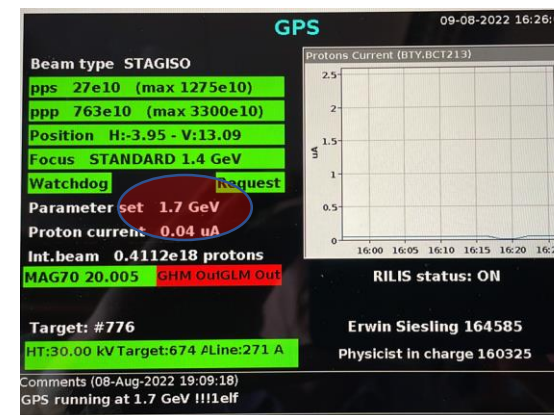
RILIS:

- Extremely busy year: 22 elements delivered for physics and development.
- Operated for 29 out of 36 weeks.
- Availability has been excellent, although support from Gatchina (RU) was missed.
- First year that LIST/PI List ran regularly for physics. Significant setting up time required, but very successful runs.



Protons:

- Availability and interactions with Booster team has been excellent throughout the year.
- 2022 saw many requests: NORMGPS/HRS; STAGISO_GPS/HRS; «stacked cycles»; Spaced cycles; and for first time 1.7GeV.
- Total number of protons delivered to ISOLDE $\sim 10^{20}$



Feedback from 1.7GeV tests (IS717)

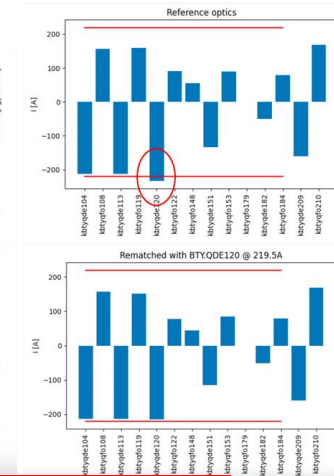
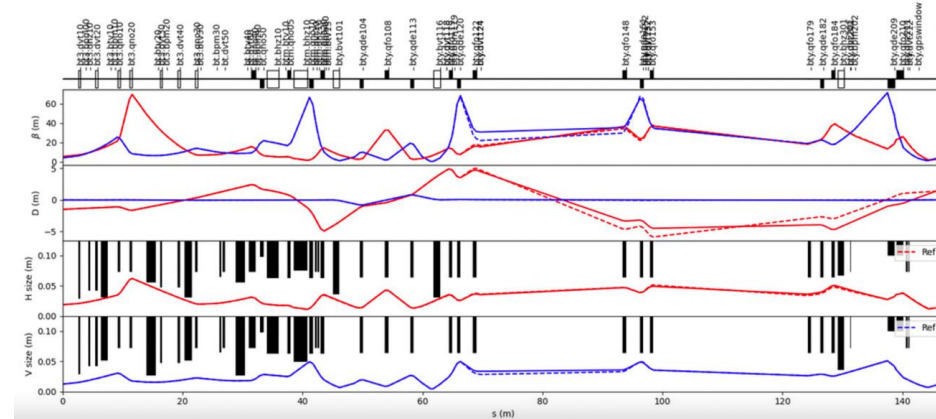
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH
 Proposal to the ISOLDE and Neutron Time-of-Flight Committee

Determination of radioactive ion beam production yields using
 1.4- and 1.7-GeV protons

May 13, 2022

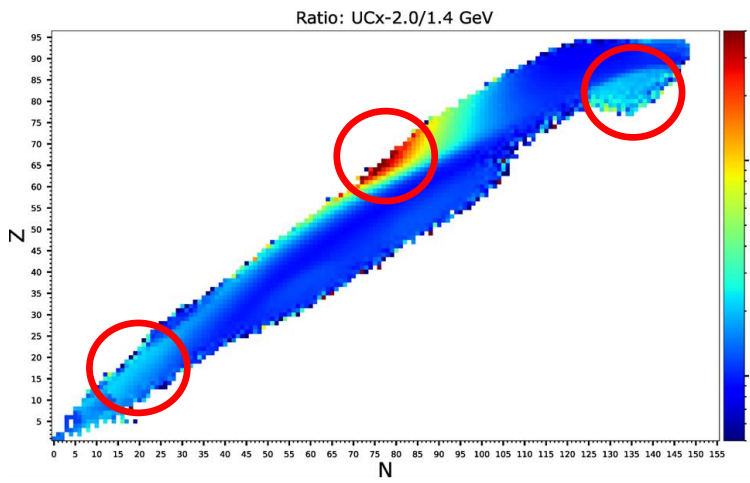
Simon Stegemann¹, Jose-Luis Sanchez Alvarez¹, Mia Au^{1,2}, Elodie Aubert¹, Ana-Paula Bernardes¹, Cyril Bernerd¹, Edouard Grenier-Boley¹, Marco Calviani¹, Francesco Cerutti¹, Katerina Chrysalidis¹, Thomas Elias Cocolios³, Gian Piero Di Giovanni¹, Alexandre Dorsival¹, Charlotte Duchemin, Sean Freeman^{1,4}, Matthew Fraser¹, Simone Gilardoni¹, Reinhard Heinke¹, Karl Johnston¹, Ulli Köster⁵, Giuseppe Lerner¹, Bruce Marsh¹, Fabio Pozzi¹, Francesc Salvat Pujol¹, João Pedro Ramos⁶, Edgar Reis¹, Jose Alberto Rodriguez Rodriguez¹, Ralf Erik Rossel¹, Sebastian Rothe¹, Jose Maria Martin Ruiz¹, Maximilian Schütt¹, Erwin Siesling¹, Piotr Krzysztof Skowronski¹, Thierry Stora¹, Joachim Vollaire¹

¹CERN, Switzerland
²Johannes Gutenberg-Universität Mainz
³KU Leuven, Institute for Nuclear and Hadron Physics
⁴The University of Manchester
⁵Institut Laue-Langevin
⁶Belgian Nuclear Research Centre

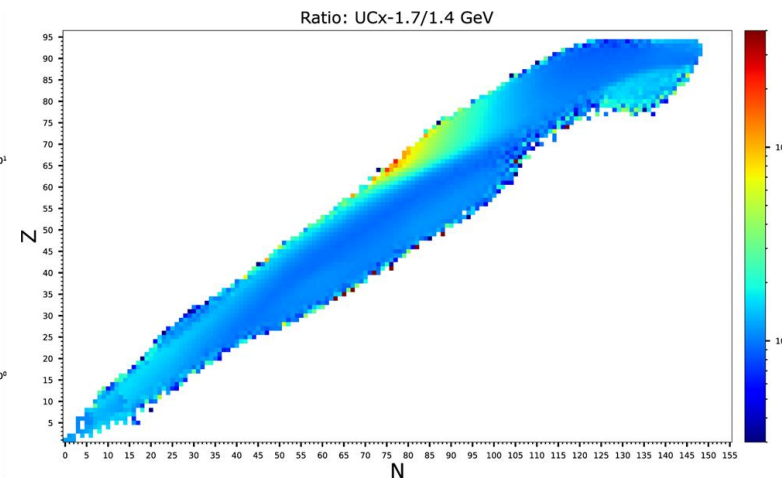


Feedback from operation in 2022, from the consolidation workshop in Oct 2022 and longer term plans are addressed in LOI252

Get full intensity



Fluka estimations



Measured yields

Clear increase in yield at 1.7GeV, verifying calculations. 2GeV protons will open new possibilities for physics.

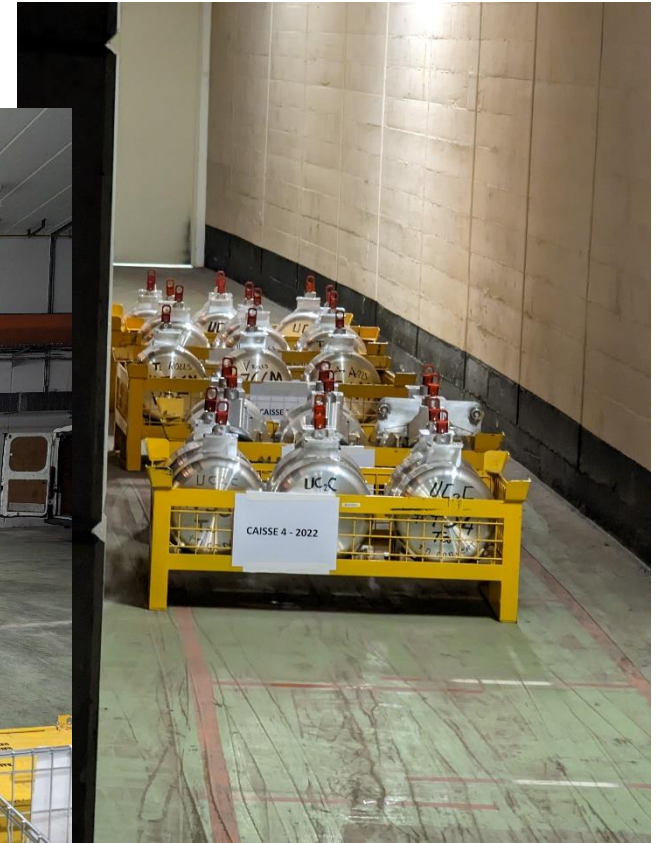
Factors ≈ 2 important, experiments done in shorter time

Factors ≈ 5 important, allows experiments with new isotopes

YETS activities for the primary areas

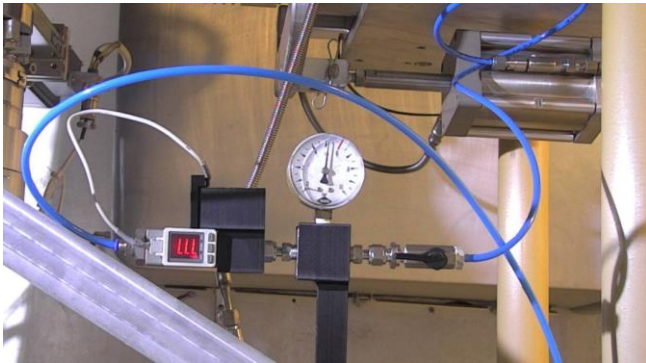
- Ventilation consolidation (controls and powering) is the main activity during this YETS (ventilation stop from the 12/12 to the 20/02 in several rooms including the target area and separator zones).
- All targets used for the 2022 run were removed from the area before the ventilation stop (transfer with remote systems to MEDICIS storage shelves and by truck to the ISR in January)
- Standard maintenance of the Frontend and other systems will start when ventilation will be operational (20/02):
 - Extraction electrodes and laser windows exchange, greasing of movable parts, cleaning of insulators....
 - Vacuum pumps maintenance (done every two years)

Transfer from target area to MEDICIS



Coupling table piston

Target area – in-situ measurements



Inspection



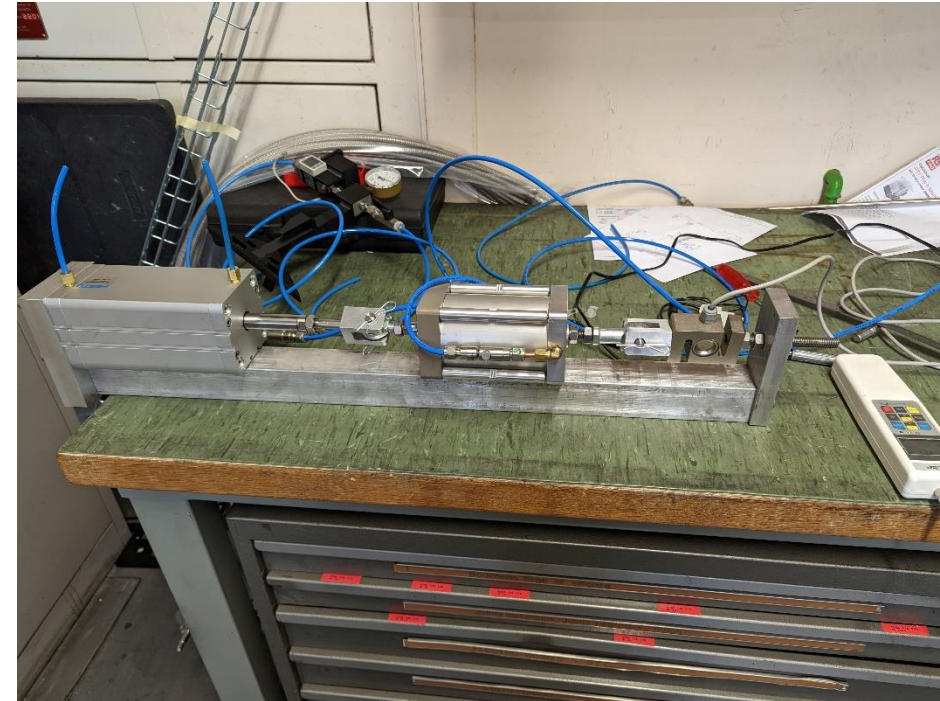
Replacement of the pistons for the coupling tables

- Problems encountered during target exchanges in 2022
- Thorough diagnostic of the HRS coupling table performances performed in before the ventilation stop
- New design with several improvements extensively tested on test bench
- Pistons will be replaced on both Frontends

Removal



Test bench (new design)



YETS REX/HIE ISOLDE activities 1/2

- HIE ISOLDE Cryo plant yearly maintenance (N. Guillotin, T. Dupont TE/CRG)
 - Progressive restarting of the Compressor station and Cold Box foreseen as of week 10 followed by the Cold Transfer Line
 - Cryo Modules cooldown starts as of week 12, as per planning
 - Compressed air back-up system has been installed and is being tested – to avoid a cryo plant stop due to loss of pressure (CERN wide comp. air stop summer 2022)
- Cryo development
 - The Cryo group has started investigations for a study to improve the cryo plant both on the process as well as additional hardware side such as an N₂ system to keep circulation GHe and the CM shields below 100K in case of unexpected cryo plant stops as well as during maintenance to reduce the impact of the warm-up/cooldown cycles on the SRF cavities(J. Bremer TE/CRG)

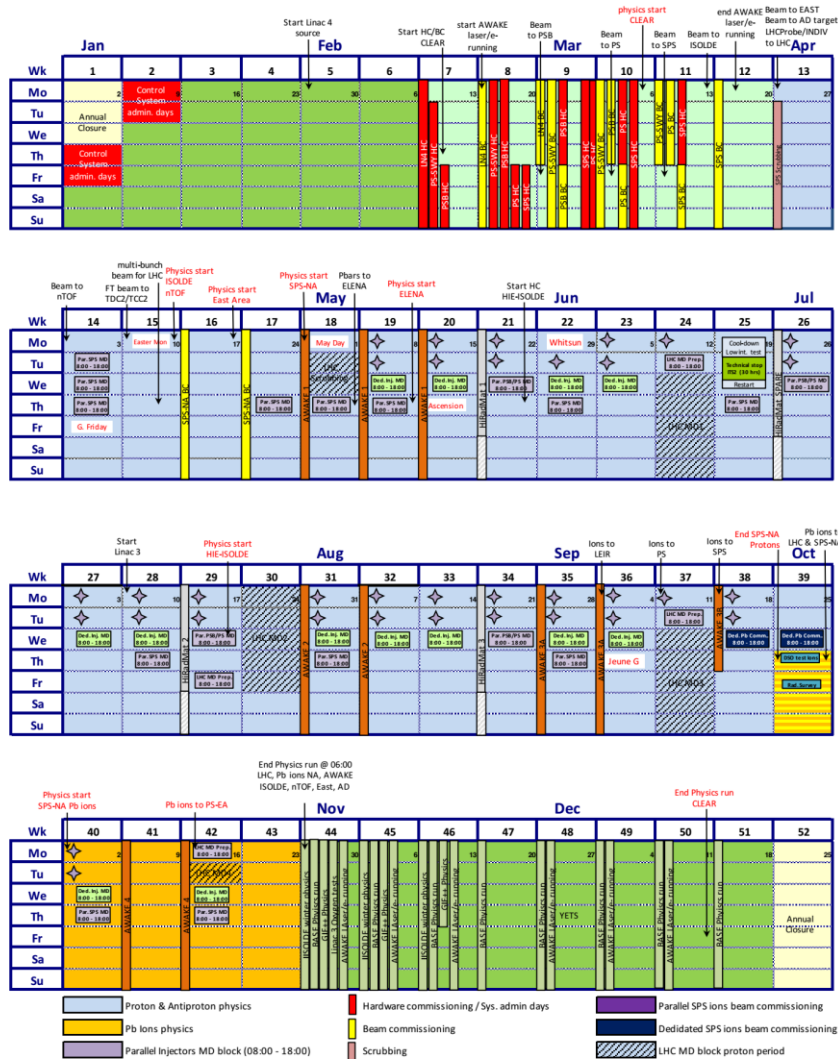


YETS REX/HIE ISOLDE activities 2/2

- REX EBIS repair (F. Wenander BE/ABP, J. Thiboud et al.)
 - Solenoid has been completely disassembled. No obvious reasons found for the higher He consumption and quenches during the 2022 run. However, the ongoing fresh re-assembly might well return the solenoid to a stable and correct working state again.
 - Finishing of the re-assembly, pumping and cooldown foreseen this week with the goal to start testing as of next week (wk 7).
 - If the tests are not satisfactory a swap for the Twin EBIS will be considered. Preparations for it are ongoing in parallel.
 - A small delay of $\sim 1 \frac{1}{2}$ week has been accumulated. This is not an issue for the restart of the REX/HIE facility. However, A change for the Twin EBIS will jeopardize the start of beam commissioning with EBIS foreseen as of 15th May and might push back first stable beam to HIE users foreseen as of 30th June
- EBIS development
 - F. Wenander BE/ABP with the Cryo group (J. Bremer TE/CRG) are looking into the implementation of a cryo cooler on the EBIS to reduce the use of He and increase the reliability and lifetime of the machine (no more EBIS warm-up cycles). Foreseen for the YETS '23-'24



Injectors Accelerator Schedule 2023
Version 1.0 was approved at the Research Board of 7 December 2022



Key dates for 2023

	ISOLDE	nTOF	AD/ELENA	PS EA FT	SPS NA FT
p (p-) start	April 10 th	April 10 th	May 11 th	April 17 th	May 1 st
p (p-) end	October 30 th	October 30 th	October 30 th	October 30 th	September 28 th
Pb ion start				October 16 th	October 2 nd
Pb ion end				October 30 th	October 30 th
Weeks 2023 (weeks 2022) % wrt 2022	29 (35 in 2022) 83%	29 (35 in 2022) 83%	24.4 p- (30.5 in 2022) 80% of the shortened 2022 run	28 p (35 in 2022) 80% 2 Pb (5 days in 2022)	21.5 p (29 in 2022) 74% 4 Pb (2 in 2022)

Relatively short run with protons in 2023. Chance of prolonged winter physics period from Oct 30th onwards. Now explicitly reserved in the master accelerator schedule.

Setup	HIE ISOLDE setup	Count of Exp. no.	Sum of Shifts remaining after 2022 till end of Run3
biophysics	N/A	1	2.5
COLLAPS	N/A	5	36
Collections: 108Ag	N/A	1	30
Collections: 163Ho	N/A	1	5
CRIS	N/A	9	96
Gandolph	N/A	1	8
Gandolph/CRIS	N/A	1	3
HIE ISOLDE	ISS	12	89
	ISS/Miniball	2	22
	Miniball	17	245
	Prototype	1	0
	SEC	1	0
	XT03	1	23
	XT03: Actar	1	21
	XT03: Corset	1	12
	XT03: Edinburgh	1	42
IDS	N/A	14	119
IDS/ISOLTRAP	N/A	1	6
ISOLTRAP	N/A	6	45
Medical physics	N/A	2	2
MIRACLS	N/A	1	17
SSP	N/A	12	83
TAS	N/A	5	40
TISD	N/A	13	86
TISD/IDS	N/A	1	0
Travelling Setup	N/A	2	17
Travelling Setup; ECSLI	N/A	1	0
VITO	N/A	1	0
WISARD	N/A	1	24
TISD/Miniball	Miniball	1	4
TISD/TDPAC	N/A	1	4
Decay spectroscopy	N/A	1	23
LA1/ECSLI	N/A	1	28
Collection for nTOF	N/A	1	45
IDS/TAS	N/A	1	3
Grand Total		122	1180.5

- ISOLDE shifts approved until end of run3
- HIE ISOLDE constitutes backlog ~40%
- Low energy easier to manage due to greater machine availability

Summary of requests for this meeting

Facility	Type	Subject area	Sum of Shifts requested	Sum of Protons requested	Count of CDS #
ISOLDE	Addendum	HIE ISOLDE	18		1
		Nuclear medicine	28		2
		SSP	20		1
	Addendum Total		66		4
	Letter of clarification	HIE ISOLDE	12		1
	Letter of clarification Total		12		1
	Letter of intent	SSP	28		4
		Upgrades	0		1
	Letter of intent Total		28		5
	Proposal	Collection	12		1
		Decay Spectroscopy	31		2
		HIE ISOLDE	80		4
		Laser spectroscopy	19		1
		Magnetic moments	11		1
		Mass Spectrometry	17		1
		Negative ions	15		1
		SSP	44		3
	Proposal Total		229		14
ISOLDE Total			335		24

Beam request for ISOLDE 2023*

ISOLDE running period: April 10th 2023 to October 30th 2023

PLEASE COMPLETE ALL INFORMATION REQUESTED AND RETURN BY February 6th 2023

Experiment IS630

Lattice sites, charge and spin states of Fe in InxGa1-xN studied with emission Mössbauer spectroscopy

Spokesperson: [H. Masenda](#); [H. P. Gunnlaugsson](#)

Spokesperson email: Hilary.Masenda@wits.ac.za ; HPGunnlaugsson@gmail.com

Contact person: [Juliana Schell](#); [karl Johnston](#)

Contact email: karl.johnston@cern.ch

Shifts used (if any) in 2022:

Shifts remaining or approved for Run3: 4

- What is the main ISOLDE limitation for your experiment/experimental programme?
- Can you tune the ISOLDE stable beam to your setup without technical assistance?

Yes No

- Please list/update the name and affiliation of collaborators working on this ISOLDE experiment: IS630
- Please fill out your data plan for IS630

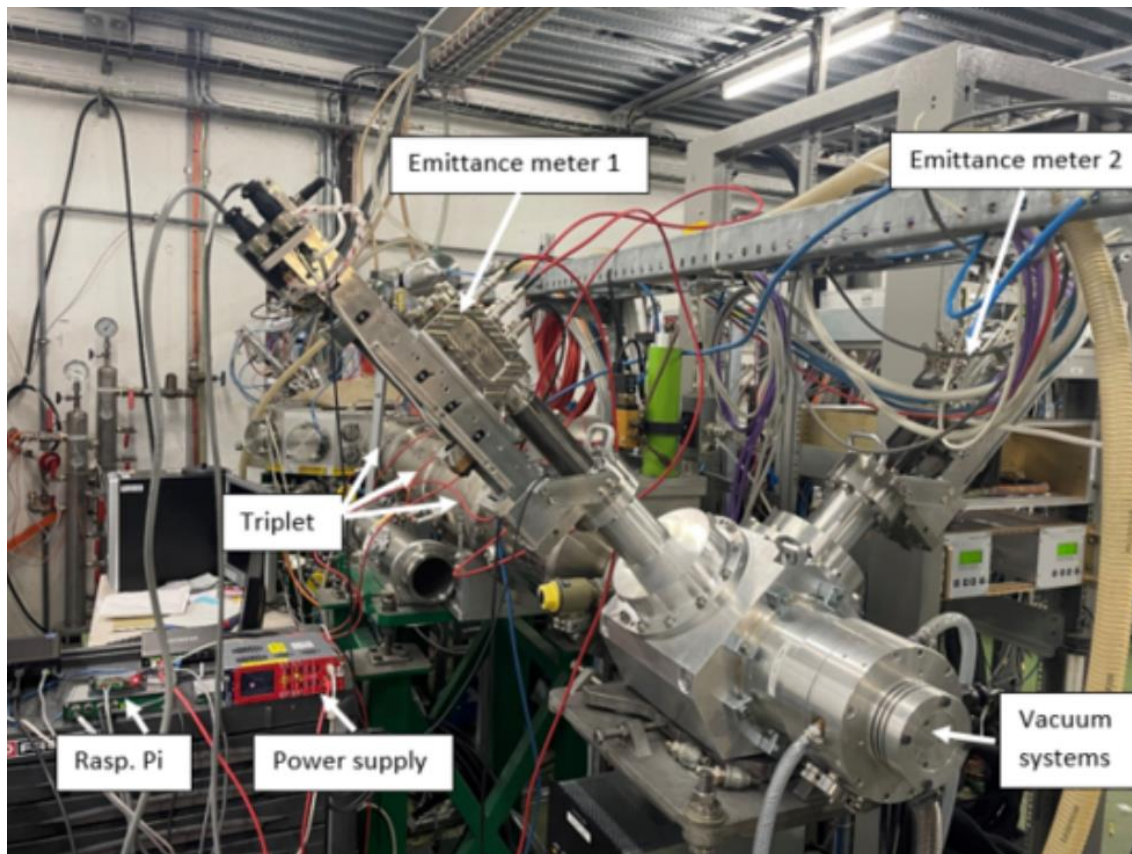
Experiment/LOI IS630	Where would your data be stored? E.g. using a repository such as Zenodo?	When would your data be released? E.g. after publications have been completed and accepted?
Is your data curated for eventual release at your home institute?		

- In the attached templates:
 - list the publications originating from **IS630 not included** in your last beam-time request
 - fill in your beam-time request 2023
 - Indicate requests for stable beam and users who may require training in 2023

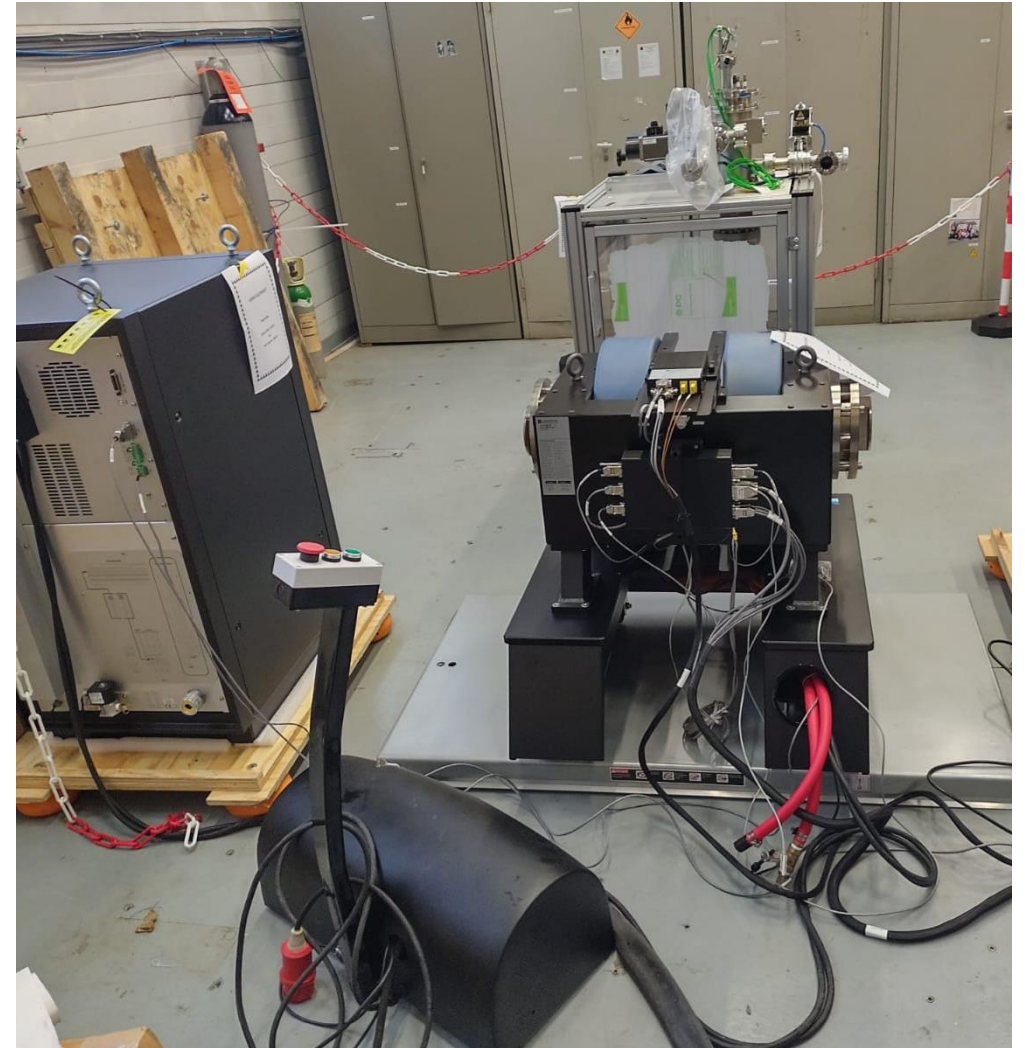
Please e-mail the completed form to karl.johnston@cern.ch

- Beam requests have been received last Monday and are being summarised.
- Aim to have first draft of schedule from April to beginning of June by end Feb
- **Eurolabs support is available, similar to previous TNA support.**
- **NOTE: in addition to open access publishing, data plan is now required to receive funding. Now a feature of the beam request.**

- MIRACLIS setup at LA2 making great progress
- Preparations for beam transport to PUMA at RC6
- New IDS frame will arrive this week



New setups for Solid state physics, as discussed in several LOIs at this meeting





Recent series of academic training lectures: available online at link below

Academic Training Lecture Regular Programme

Principles of radioisotope production with ISOL techniques, materials and ion sources (1/3)

by Sebastian Rothe (CERN)

 Tuesday 17 Jan 2023, 11:00 → 12:00 Europe/Zurich

 500/1-001 - Main Auditorium (CERN)

Academic Training Lecture Regular Programme

Laser resonance ionization at ISOL facilities (2/3)

by Bruce Marsh (CERN)


 Wednesday 18 Jan 2023, 11:00 → 12:00 Europe/Zurich


 500/1-001 - Main Auditorium (CERN)

Academic Training Lecture Regular Programme

Non-conventional radionuclides in personalised medicine (3/3)

by Thierry Stora (CERN)

 Thursday 19 Jan 2023, 11:00 → 12:00 Europe/Zurich

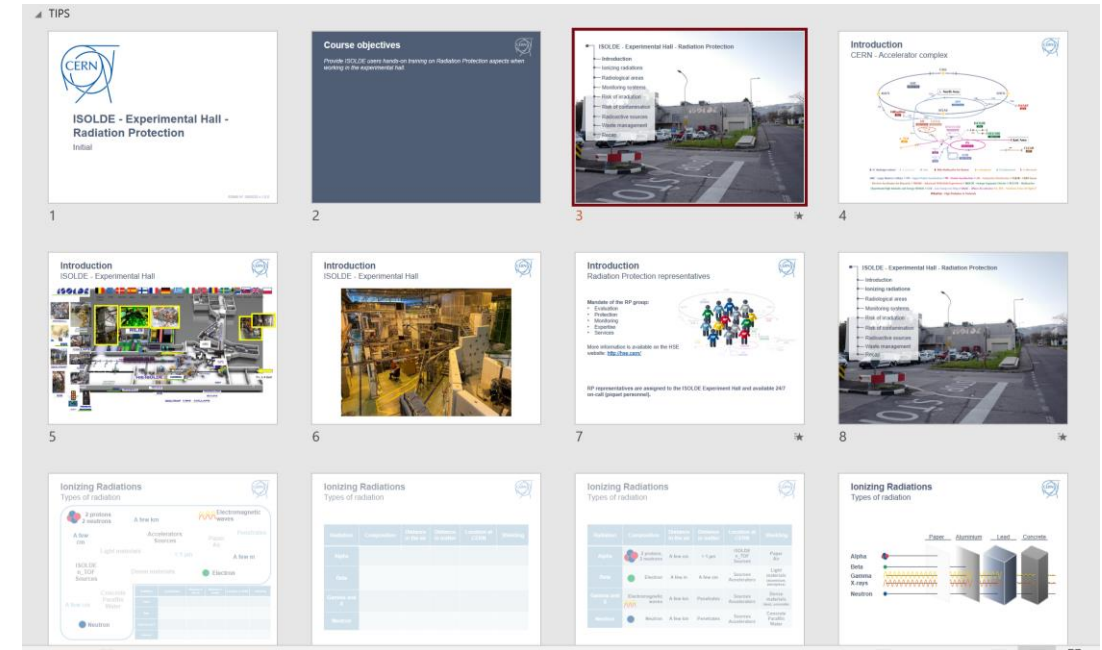
 500/1-001 - Main Auditorium (CERN)

<https://indico.cern.ch/category/72/>

Training

- In addition to the (ever-growing) number of online courses...
- Hands-on RP and Electrical training
- 15 day deadline before scheduled course is cancelled. (has led to issues last year)
- New EP-wide electrical course for all users/staff who need to work in an experimental area.
- Both will take place on Tuesday but time has increased:
 - EP course 0830 till 1230
 - RP course 1400 till 1630
- Availability of Electrical course not very stable. **Taking all online courses will grant electrical training ranks (for the moment at least).** Long term users based at CERN should try to take it when possible.

Ad hoc sessions are available, but (especially in running period!!) are difficult to manage



In LMS:
ISOLDE - Experimental Hall - Radiation Protection - Handling (Covid-19)

Electrical Safety - Working in EP experiments