

# Welcome to the ISOLDE Workshop and Users Meeting 2023

Kindly sponsored by:







## 2023 - another good year for physics!

- Delivered beams to 59 INTC Proposals and Letters of Intent, including 10 HIE-ISOLDE experiments.
- 470 shifts for physics and machine development –excellent year of running, despite shorter running period!
- Includes three weeks winter physics: (i) transfer reactions on a  $^7\text{Be}$  at ISS, (ii) laser studies of radioactive  $^{223,225}\text{RaF}$  molecules at CRIS and (iii) isotope collections  $^{226}\text{Ra}$  and  $^{110\text{m}}\text{Ag}$ .
- Technical issues were quickly solved due to commitment of highly-skilled teams from CERN Acc & Tech Sector – “thank you for your dedication”!
- Just a few examples of developments - COLLAPS implemented ROC; MIRACLS started commissioning this summer; polarisation-assisted decay spectroscopy started at VITO; refurbished MINBALL detector running well; and other experimental installations operated by users (mostly) ran smoothly.



## Article

# Observation of the radiative decay of the $^{229}\text{Th}$ nuclear clock isomer

<https://doi.org/10.1038/s41586-023-05894-z>

Received: 20 September 2022

Accepted: 28 February 2023

Published online: 24 May 2023

 Check for updates

Sandro Kraemer<sup>1,2,3\*</sup>, Janni Moens<sup>3</sup>, Michail Athanasakis-Kaklamanakis<sup>1,4</sup>, Silvia Bara<sup>1</sup>, Kjeld Beeks<sup>5</sup>, Premaditya Chhetri<sup>1</sup>, Katerina Chrysalidis<sup>4</sup>, Arno Claessens<sup>1</sup>, Thomas E. Cocolios<sup>1</sup>, João G. M. Correia<sup>6</sup>, Hilde De Witte<sup>1</sup>, Rafael Ferrer<sup>1</sup>, Sarina Geldhof<sup>1</sup>, Reinhard Heinke<sup>4</sup>, Niyusha Hosseini<sup>5</sup>, Mark Huyse<sup>1</sup>, Ulli Köster<sup>7</sup>, Yuri Kudryavtsev<sup>1</sup>, Mustapha Laatiaoui<sup>8,9,10</sup>, Razvan Lica<sup>4,11</sup>, Goele Magchiels<sup>3</sup>, Vladimir Manea<sup>1</sup>, Clement Merckling<sup>12</sup>, Lino M. C. Pereira<sup>3</sup>, Sebastian Raeder<sup>9,10</sup>, Thorsten Schumm<sup>5</sup>, Simon Sels<sup>1</sup>, Peter G. Thirolf<sup>2</sup>, Shandirai Malven Tunhuma<sup>3</sup>, Paul Van Den Bergh<sup>1</sup>, Piet Van Duppen<sup>1</sup>, André Vantomme<sup>3</sup>, Matthias Verlinde<sup>1</sup>, Renan Villarreal<sup>3</sup> & Ulrich Wahl<sup>6</sup>

- First direct evidence of the uv decay of the  $^{229}\text{Th}$  isomer.
- More precise measurement of energy, only 8.338(24) eV.
- Measurement of  $\tau_{1/2}$  for isomer embedded in  $\text{MgF}_2$  670(102)s.

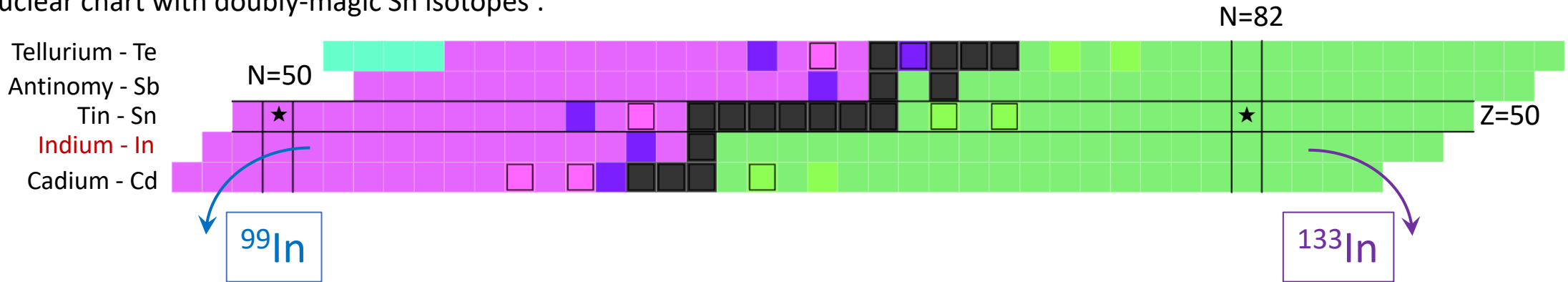


Sandro Kraemer  
ISOLDE physicist  
LMU Munich / KU Leuven

<https://videos.cern.ch/record/2297990>

# Indium – from one extreme to the other - two back-to-back ISOLDE PRL's in July

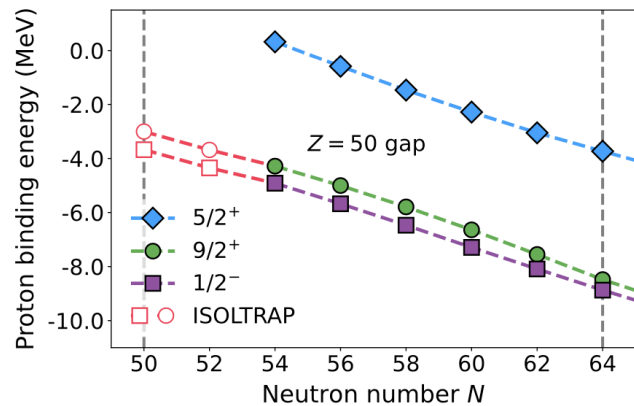
Part of nuclear chart with doubly-magic Sn isotopes :



PHYSICAL REVIEW LETTERS **131**, 022502 (2023)

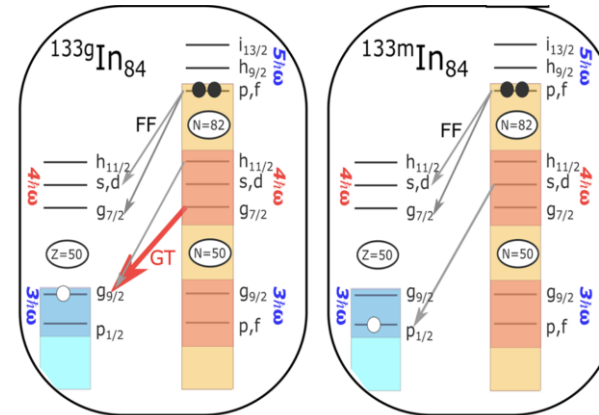
PHYSICAL REVIEW LETTERS **131**, 022501 (2023)

## Isomeric Excitation Energy for $^{99}\text{In}^m$ from Mass Spectrometry Reveals Constant Trend Next to Doubly Magic $^{100}\text{Sn}$



- Precision measurement of ground and isomeric state using ISOLTRAP.
- Excitation of isomer extremely constant across In, contrasts magnetic moment, which increases near N=50.
- Very difficult to reproduce with modern calculations.

## $^{133}\text{In}$ : A Rosetta Stone for Decays of $r$ -Process Nuclei



- Measured  $\beta$  decays from ground and isomeric levels using IDS.
- Decays populate unbound levels in  $^{133}\text{Sn}$ .
- Measured resonance properties critical for benchmarking models of the *astrophysical r process*.

*Good example of versatility of ISOLDE – precision studies of both neutron-rich and neutron-deficient exotic isotopes separated by 34 neutrons!*

# Proposed Decision Timeline for the ISOLDE Improvement program

Consolidation and improvements up to and during LS3: 2 GeV, proton dumps, fire safety improvements, reliability of REX, maintaining the long-term performance of SC linac, review/cons target systems and low energy lines...  
(see Joachim's presentation).

ISOLDE Mini-workshop on Consolidation and Improvement program (October 2022)

*To collect needs for consolidation and improvement of the facility based on physics needs and facility life-time*

ISCC (November 2022)

*To state collaboration clear interest and support to the improvement program, in particular to the 2 GeV case*

Strategy presentation to JAPW of integrated improvement program (December 2022)

*To define overall project to coordinate consolidation and improvement needs*

RB (December 2022)

*To approve proposed roadmap for final approval*

IEFC: IBDRS and 2 GeV technical implementation proposal (January 2022)

*To endorse technical solutions and timeline for*

*implementation*

INTC (February 2023)

*To re-state on physics program and interest on 2 GeV*

RB (March 2023)

*Input from INTC on physics thanks to proposed improvement program and conclusions from IEFC about technical implementation*

MTP 2023

*ATS to put urgent items for MTP2023*

Cost, Schedule and Scope Review (December 2023)

*To review project definition, risks, and resources*

MTP 2024

*ATS to put forward rest of consolidation and improvement program with horizon between 2023 and post-LS3*

*In a very difficult financial climate...*



# EURO-LABS running for 1 year.

1st Sept to 31st Aug 2023 supported 157 researcher-visits on 44 experiments – mostly early-stage researchers or first-time users.

A reminder to spokespeople of the obligations of support:

(i) Acknowledge EURO-LABS support on all publications, talks, data releases etc:

“This project has received funding from the European Union’s Horizon Europe Research and Innovation programme under Grant Agreement No 101057511.”

(ii) Open Access Publications.

(iii) Open Data.

# Open Science

*“If paid for by public funds, outcomes should be public.”*

EURO-LABS and Horizon Europe requirement.  
CERN requirement.

Many national funders have similar requirements

## (i) Open Data:

ISCC produced a policy and advice for ISOLDE – circulated to collaboration email.

For EURO-LABS, need to keep a record – most spokespersons will use Zenodo and will make data public after the publication of the main results.

## (ii) Open Access Publications:

Good on green – but need to be gold!

But a few publications slipping through both...

CERN Library compiled some useful advice, which has been circulated to the Collaboration.

Several popular journals (PRL, PRC..) will automatically do Gold Open Access if they know the manuscript is from a CERN collaboration.



# Health and Safety Update

## Incident:

Very serious incident in October – analysis and review is on-going.

## Review of Safety and Incidents:

The frequency of incidents has triggered CERN-HSE to set up a wider review of ISOLDE to look for improvements across the board – only just set up, details to come.

*We should not wait for recommendations from the incident and review to raise awareness.  
I would like to ask for your help and support with H&S topics within your national communities – it would be helpful for all members of the collaboration to act as advocates.*

Ensure that all written procedures are followed to the letter –used as check list as the procedure is performed. If procedure presents issues (either matters of safety or ease of undertaking activity) then EP Safety will help with modifications, but nothing should be changed until approved.

Follow PPE and other requirements in the hall.

In the meantime, a new process for radioactive sources is being rolled out and a better system to log and track contaminated equipment and radioactive samples.



# ISOLDE Visits...

162 visits and 1635 visitors to ISOLDE this year – the majority young people....

“Thank you” to *Patrick MacGregor* coordinating visits and to the local team of staff, fellows, students and long-stay users who act as hosts - the visitors always leave happy and enlightened.

I’ve hosted quite a few visits by funders and politicians....

Deputy Director General, Department of Science and Innovation, South Africa.

BMBF and DESY Project Office, Germany.

President of CSIC, Spain.

STFC Council, UK.

Director of National Physical Laboratory, UK.

Parliamentary Portfolio Committee, South Africa.

Board of the Helsinki Institute of Physics, Finland.

Director of iThemba Laboratories, South Africa.

President of TENMAK, Turkey.

Department of Further and Higher Education, Research, Innovation and Science, Ireland.

....if you know your funder is coming to CERN, suggest they visit ISOLDE!

...and also, some celebrities.

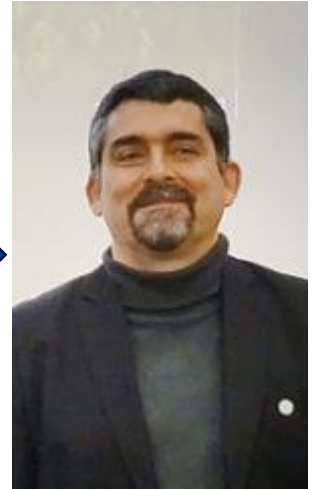


Ch-ch-ch-ch-changes....

## ISOLDE Physics Coordinator



## ISCC Chair



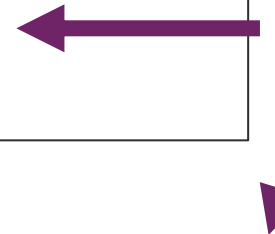
*My tenure as Section Leader and Collaboration Spokesperson ends in July 2025 – the ISCC will start recruitment of a successor next summer so encourage good candidates.*

# Perceptions...ever wondered how are you viewed by CERN?

*From a talk on the Outcome of MTP2023 by Mike Lamont, Director of Accelerator and Technology Sector at the Injectors and Experimental Facilities Committee in May:*

## **Draft MTP23 relatively well received over, ATS side:**

- 23/24 for ECN3 discussed but not disputed, but it was noted that budget for the future years were still to be allocated within a tight envelope.
- ECN3 generic well received by SPC with positive recommendation going forward to FC and Council
- Additional allocation for **NA-CONS phase 1**, and allocation for **phase 2** out to 2033 accepted without noticeable reservation for the moment. **This is an important step** and shows a commitment to North Area exploitation in the longer term.
- **New SRF building** indicate that a robust **SRF R&D programme** is a priority for the organization
- Effective exploitation of **ISOLDE** is important in long term – strong and vocal physics community
- FC would like more input on new SRF building and ISOLDE but not the above



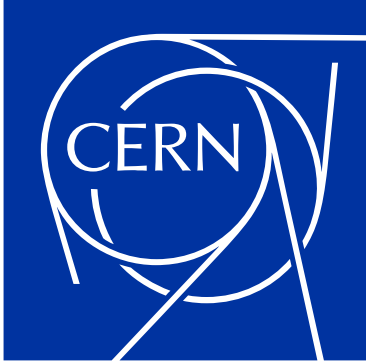
*From ATS News September 2023:*

These additional investments included strong support for ATS activities and funding for: ...ISOLDE consolidation, assuring the facility's unique capabilities in radioactive ion research allowing it to continue to effectively meet the demands of an enthusiastic physics community.



*I'm looking forward to spending time with so many strong,  
enthusiastic and vocal physicists!*  
(144 in person and 75 online).

# Enjoy the Workshop!



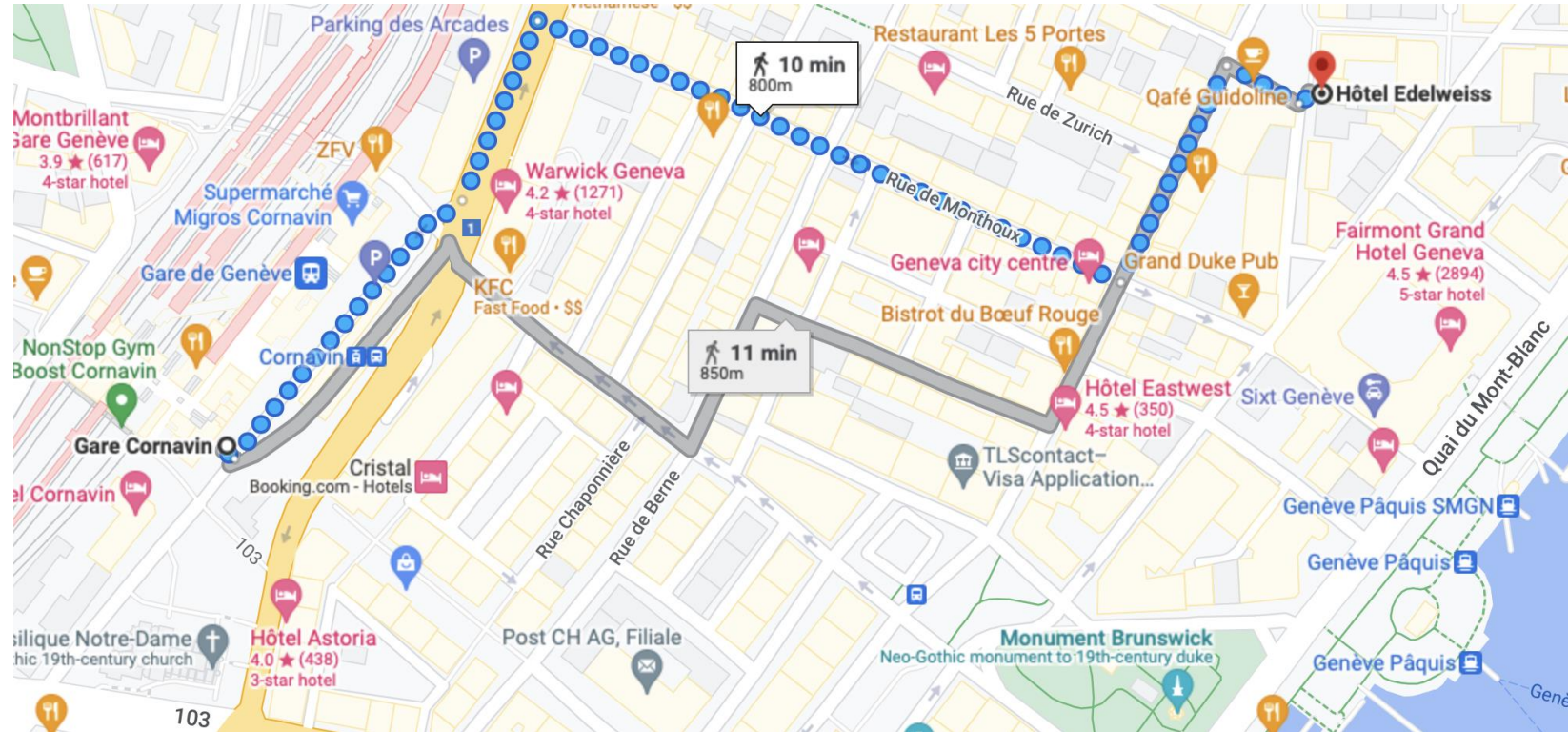
[home.cern](http://home.cern)

## 7:15 pm Hotel Edelweiss - Place de la Navigation 2 bis, 1201 Genève

Take an 18 tram from CERN – every ten minutes – journey time 24 minutes - 3 CHF ticket one way.  
5-10 minute walk to the hotel from Cornavin – several crossings so luck with the lights makes a difference!



You need to sit on table according to the type of fondue you ordered – chance meet some new people!



WARNING – I believe the last tram back to CERN from Cornavin **00:30 – but check me so you don't walk home!**

First tram back to CERN from Cornavin **04:36 – in case you want a really good night out!**