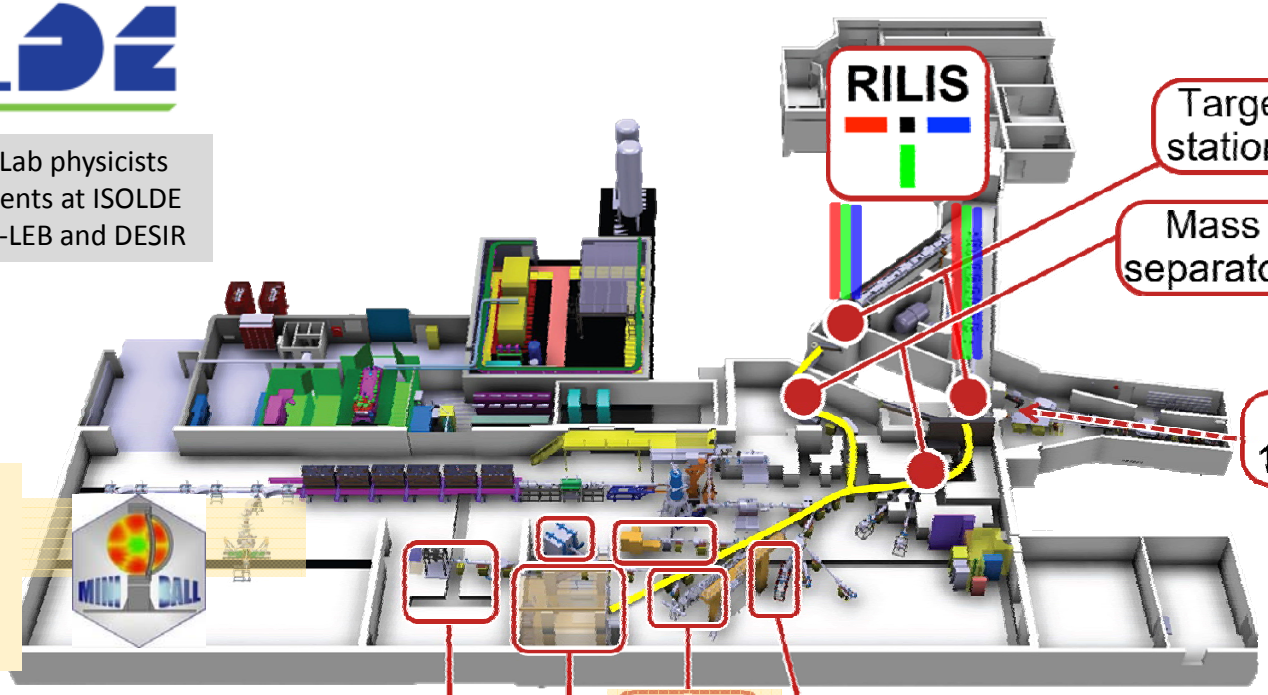
Long-term involvement of IJCLab physicists in laser and trapping experiments at ISOLDE with strong connections to S^3-LEB and DESIR



- Serge Franchoo
- Georgi Georgiev
- Radomira Lozeva
- Iolanda Matea
- Konstantin Stoychev

TDPAC

- G. Georgiev
- K. Stoychev

ISOLDE Decay Station

CRIS

COLLAPS

- Georgi Georgiev
- Serge Franchoo
- Deyan Yordanov

ISOL TRAP

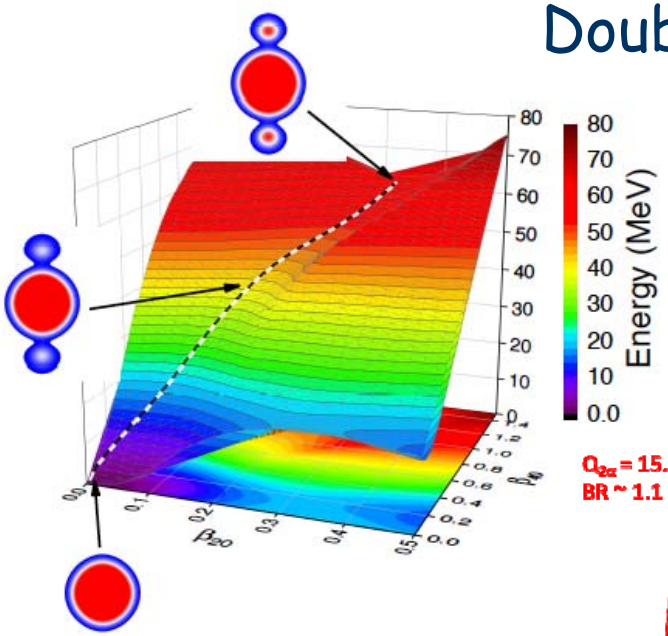
- David Lunney
- Vladimir Manea
- Sarah Naimi

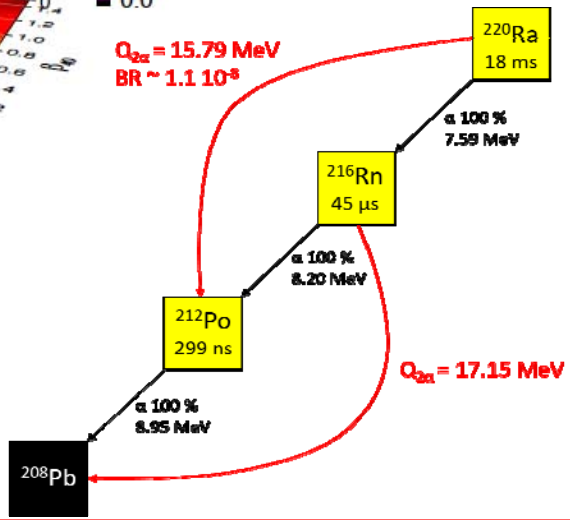
2α radioactivity

- Marlène Assié
- Didier Beaumel
- Yorick Blumenfeld
- Iulian Stefan
- Elias Khan

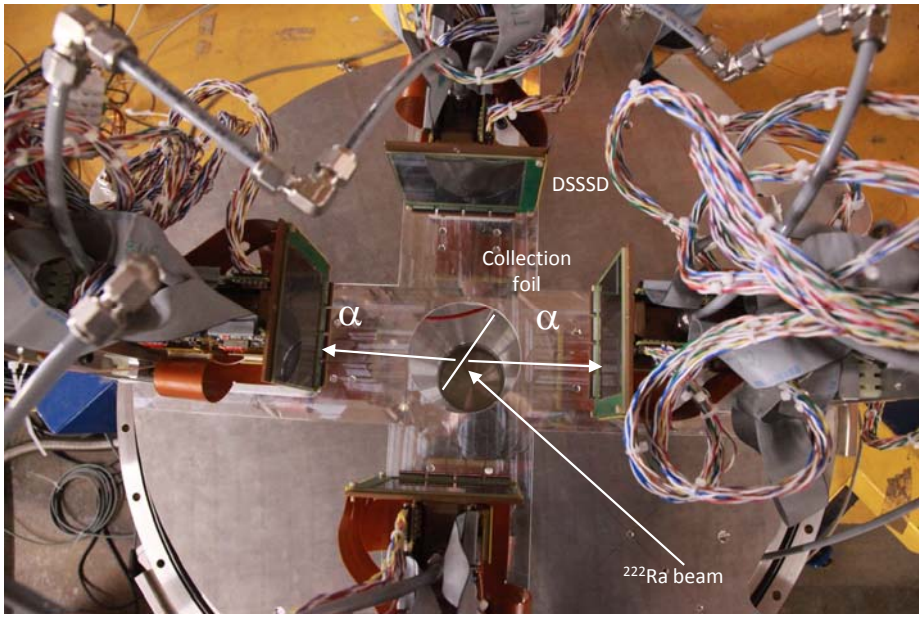
Double alpha experiment (IS-712)

IS712





MUSETT sur LA1 @ ISOLDE

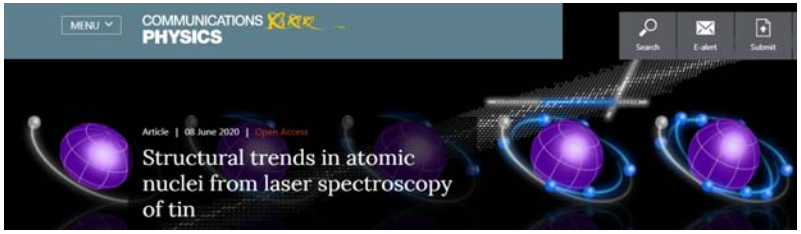


Expérience en cours (fini demain)!

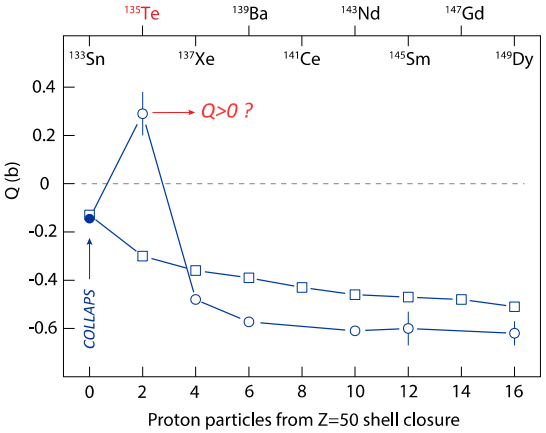
- Prediction of simultaneous 2-alpha radioactivity: F. Mercier, E. Khan et al. *Phys. Rev. Lett.* (2021)
- The two alphas emitted back to back with identical energies (but weak branching ratio…)
- Experimental proposal at CERN-ISOLDE to discover this effect : INTC-P-616; spokespersons E. Khan & Ch. Theisen

Laser spectroscopy – spins, moments, charge radii

Simple patterns in complex nuclei: Cd → Sn/Te



*D. T. Yordanov, L. V. Rodríguez, et al. Commun. Phys. **3**, 107 2020*



PHYSICAL REVIEW C
covering nuclear physics

Highlights | Recent | Accepted | Collections | Authors | Referees | Search | Press

Open Access

Probing the single-particle behavior above ^{132}Sn via electromagnetic moments of ^{133,134}Sb and $N = 82$ isotones

S. Lechner, Z. Y. Xu, M. L. Bissell, K. Blaum, B. Cheal, G. De Gregorio, C. S. Devlin, R. F. Garcia Ruiz, H. Heylen, P. Imgram, A. Kanellakopoulos, Á. Koszorús, S. Malbrunot-Ettenauer, R. Neugart, G. Neyens, W. Nörtershäuser, P. Plattner, L. V. Rodríguez, X. F. Yang, and D. T. Yordanov

Phys. Rev. C **104**, 014302 – Published 2 July 2021

PHYSICAL REVIEW LETTERS **128,** 022502 (2022)

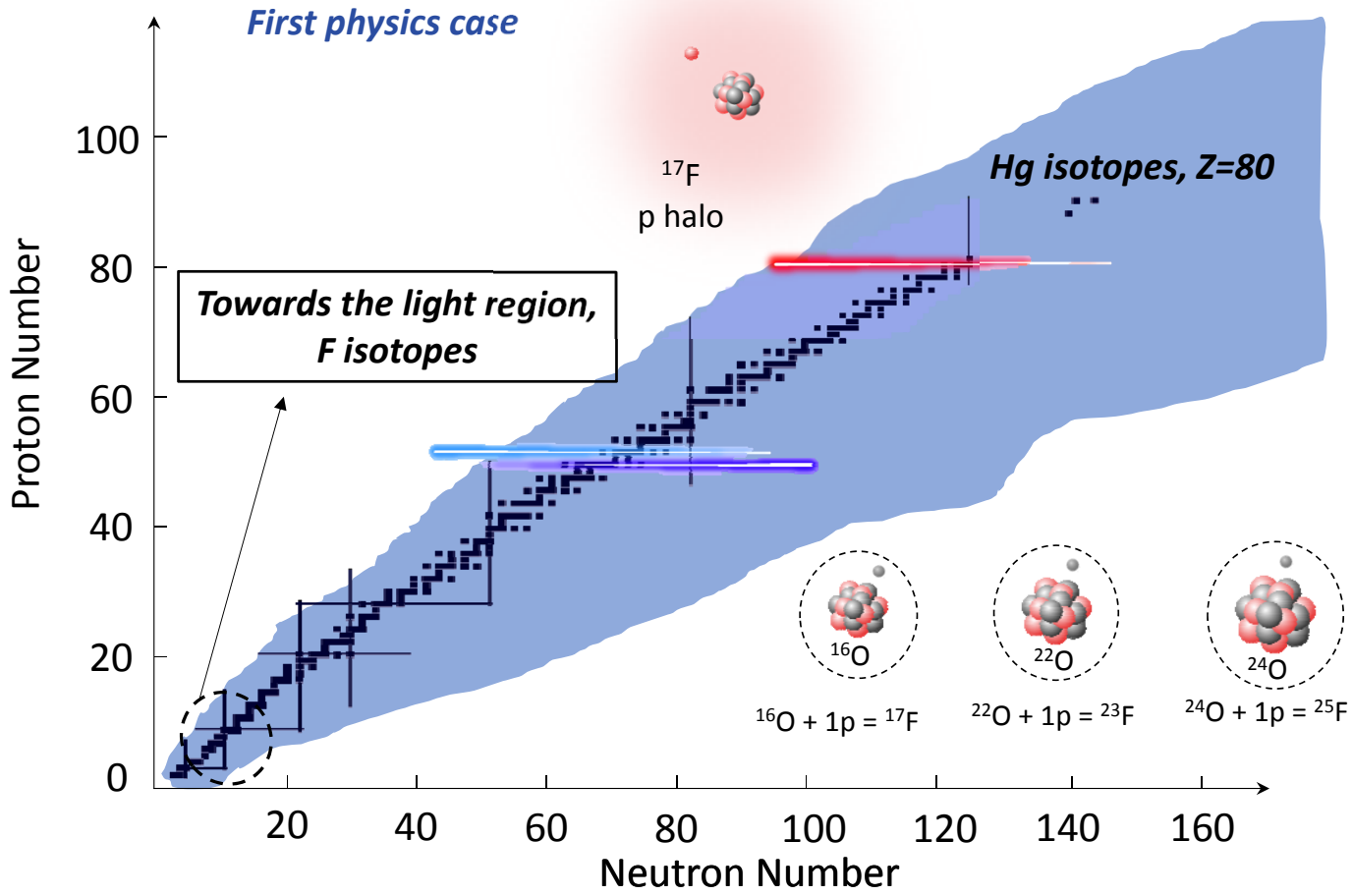
Nuclear Charge Radii of the Nickel Isotopes $^{58-68,70}$Ni

S. Malbrunot-Ettenauer,[1,*] S. Kaufmann,[2,†] S. Bacca,[3,4] C. Barbieri,[5,6,7] J. Billowes,[8] M. L. Bissell,[8] K. Blaum,[9] B. Cheal,[10] T. Duguet,[11,12] R. F. Garcia Ruiz,[8,1,‡] W. Gins,[12,§] C. Gorges,[2] G. Hagen,[13,14] H. Heylen,[9,1] J. D. Holt,[15,16] G. R. Jansen,[13,17] A. Kanellakopoulos,[12,‖] M. Kortelainen,[18] T. Miyagi,[15] P. Navrátil,[15] W. Nazarewicz,[19] R. Neugart,[9,20] G. Neyens,[1,12] W. Nörtershäuser,[2,¶] S. J. Novario,[14,13] T. Papenbrock,[14,13] T. Ratajczyk,[2] P.-G. Reinhard,[21] L. V. Rodríguez,[1,9,22] R. Sánchez,[23] S. Sailer,[24] A. Schwenk,[2,25,9] J. Simonis,[3] V. Somà,[11] S. R. Stroberg,[26] L. Wehner,[20] C. Wraith,[10] L. Xie,[8] Z. Y. Xu,[12] X. F. Yang,[27,12] and D. T. Yordanov[22]

N-rich Te (Z=52) IS-667 (measured in 2022)

+ N-def Tl (Z=81) proposal (accepted/measured in 2022)

Highlights 2023 -2024 - Pushing COLLAPS towards more exotic nuclei



Courtesy of Liss V. Rodríguez

Request: 2.5 kE missions (D. Yordanov)

Rotational and Hyperfine Structure of RaF and AcF Molecules: route to higher sensitivity for EDM

nature

Article

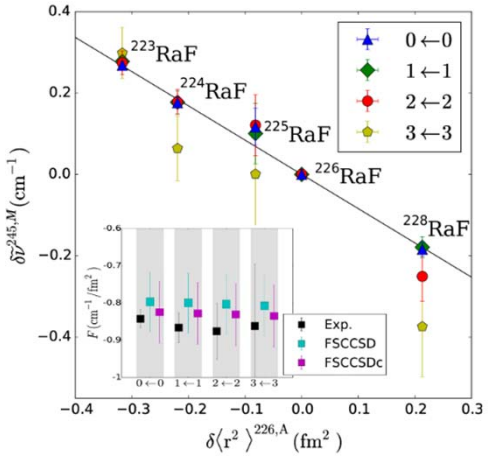
Spectroscopy of short-lived radioactive molecules

https://doi.org/10.1038/s41586-020-2299-4
Received: 24 July 2019
Accepted: 13 March 2020
Published online: 27 May 2020
Open access

R. F. Garcia Ruiz[1,2,12], R. Berger[3,12], J. Billowes[1], C. L. Binnersley[1], M. L. Bissell[1], A. A. Breier[1], A. J. Brinson[1], K. Chrysalidis[1], T. E. Cocolios[4], B. S. Cooper[1], K. T. Flanagan[1,5], T. F. Giesen[3], R. P. de Groote[6], S. Franchoo[7], F. P. Gustafsson[7], T. A. Isaev[8], Á. Koszorús[6], G. Neyens[1,6], H. A. Perrett[1], C. M. Ricketts[9], S. Rothe[1], L. Schweikhard[10], A. R. Vernon[4], K. D. A. Wendt[11], F. Wienholtz[1,10], S. G. Wilkins[1] & X. F. Yang[10]

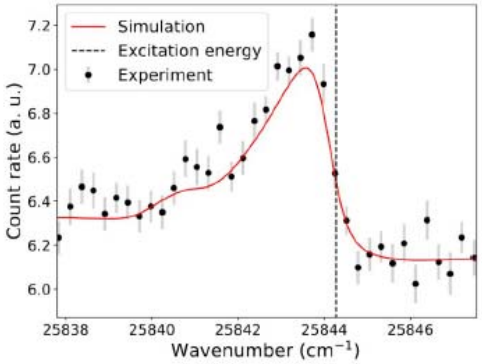
396 | Nature | Vol 581 | 28 May 2020

High resolution: Udrescu et al. PRL (2021)

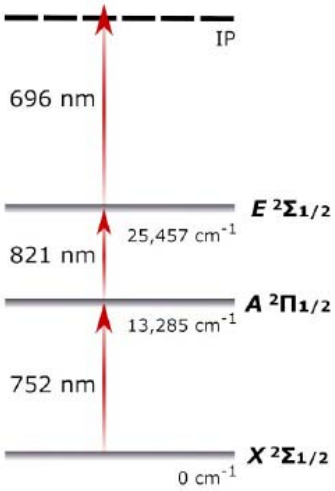


NEXT IS-706: Schiff moment in AcF

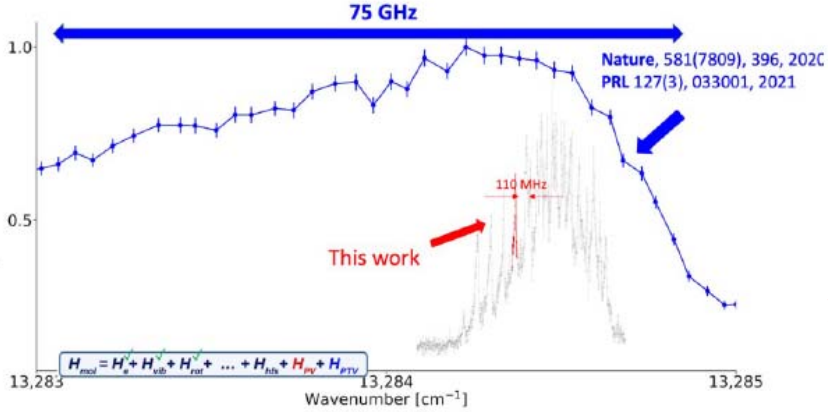
experiment 2022: AcF
two valence electrons make for complicated structure



analysis 2023:
publication being
prepared on IP RaF



experiment 2023:
resume RaF at
high resolution
(this November)



Request: 2.5 kE missions (S. Franchoo)

At Orsay: produce PaO target? (discussions with LAC, unclear which molecule to go for)
At Ganil: ebis + STJ detectors? (search for low-energy parity doublets at S3)

CRIS

Laser spectroscopy – spins, moments, charge radii

nature physics Letters
https://doi.org/10.1038/s41567-021-xxxx

Mass measurements of $^{99-101}$In challenge ab initio theory of the nuclide ^{100}Sn

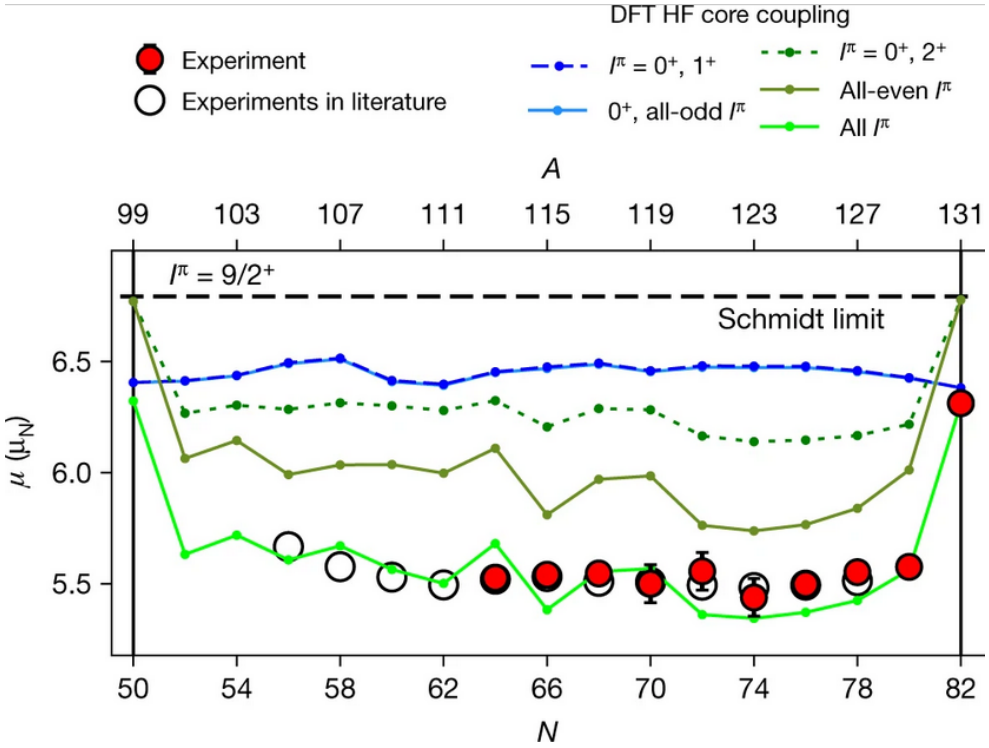
M. Mougeot,[1,2] D. Atanasov,[2] J. Karthein,[1,2] R. N. Wolf,[3] P. Ascher,[4] K. Blaum,[1] K. Chrysalidis,[2] G. Hagen,[5,6] J.D. Holt,[7,8] W.J. Huang,[1] G.R. Jansen,[9] I. Kulikov,[10] Yu. A. Litvinov,[10] D. Lunney,[11] V. Manea,[2,11] T. Miyagi,[7] T. Papenbrock,[5,6] L. Schweikhard,[12] A. Schwenk,[13,14,1] T. Steinsberger,[1] S.R. Stroberg,[15] Z. H. Sun,[5,6] A. Welker,[2] F. Wienholtz,[2,12,13] S.G. Wilkins, [2] and K. Zuber [16]

nature 607, 260 (2022)

Nuclear moments of indium isotopes reveal abrupt change at magic number 82

A.R. Vernon, R.F. Garcia Ruiz, ... G. Georgiev, ... and D.T. Yordanov

Precision laser spectroscopy of the magnetic and quadrupole moments of $^{113-131}$In combined with many-body theories (ab-initio and DFT) reveal an abrupt change at N=82



PHYSICAL REVIEW LETTERS

Accepted June 2, 2023

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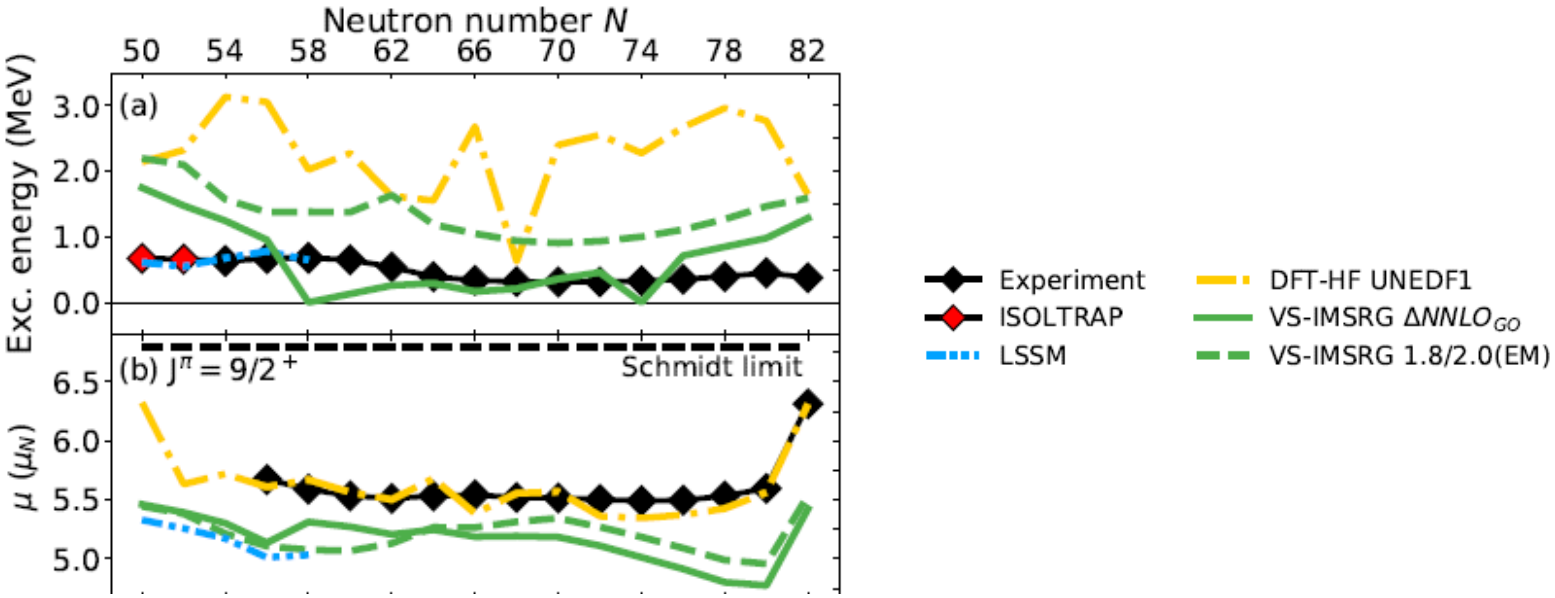
Accepted Paper

Isomeric excitation energy for $^{99}\mathrm{In}^{m}$ from mass spectrometry reveals constant trend next to doubly magic $^{100}\mathrm{Sn}$

Phys. Rev. Lett.

L. Nies, D. Atanasov, M. Athanasakis-Kaklamanakis, M. Au, K. Blaum, J. Dobaczewski, B. S. Hu, J. D. Holt, J. Karthein, I. Kulikov, Yu. A. Litvinov, D. Lunney, V. Manea, T. Miyagi, M. Mougeot, L. Schweikhard, A. Schwenk, K. Sieja, and F. Wienholtz



Spectrométrie de masse avec ISOLTRAP

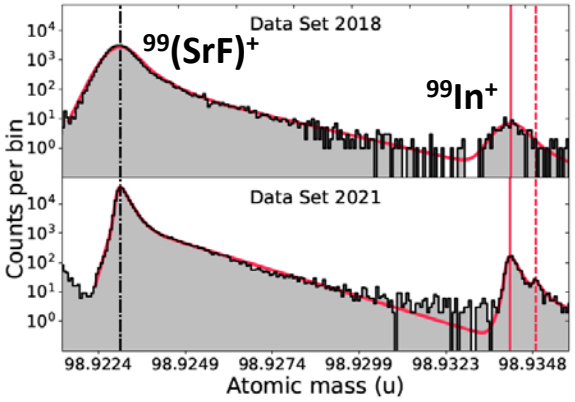
Activité 2022-2023:

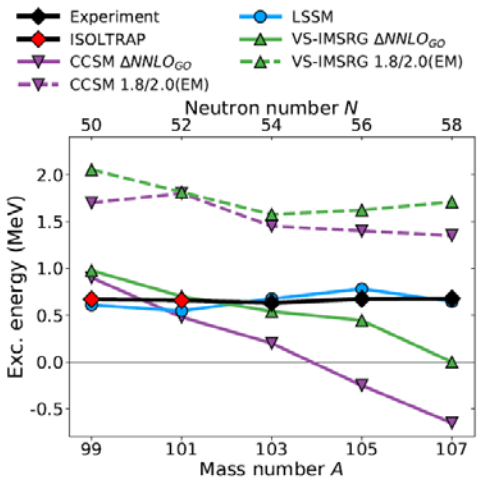
- Nouveau article en presse à Physical Review Letters:
  - Amélioration de la résolution en masse du MR-TOF MS de ISOLTRAP à 400 000
  - Energie d'excitation de l'isomère en ^{99}In (N = 50) déterminée pour la première fois
- Proposition scientifique (porte parole V. Manea) pour étudier la couche N = 126 dans la chaine d'Au.
  - Première manipe de test en Octobre 2023
- Réunion de la collaboration ISOLTRAP organisée à Orsay
- Publication générale sur le shell gap dérivée des masses:
  V. Manea, M. Mougeot, D. Lunney, EPJA (2023)

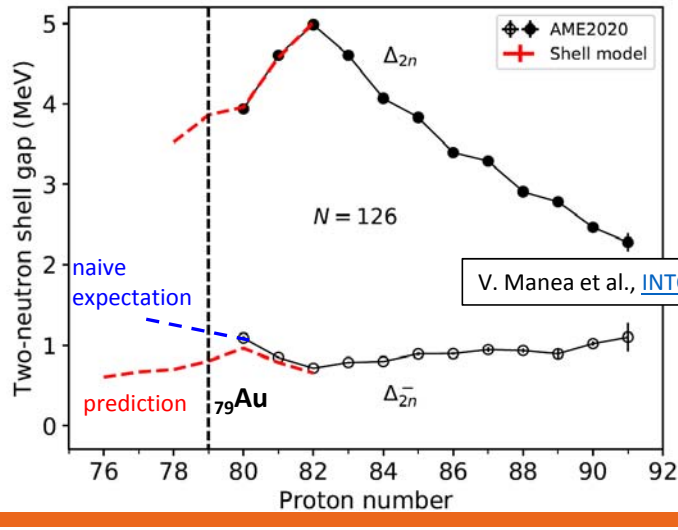
Demande 2024:

- Pour Vladimir Manea, David Lunney, Elodie Morin, Sarah Naimi, Maroua Benhatchi
- 14 kEUR de missions

L. Nies et al., PRL, in press (2023)



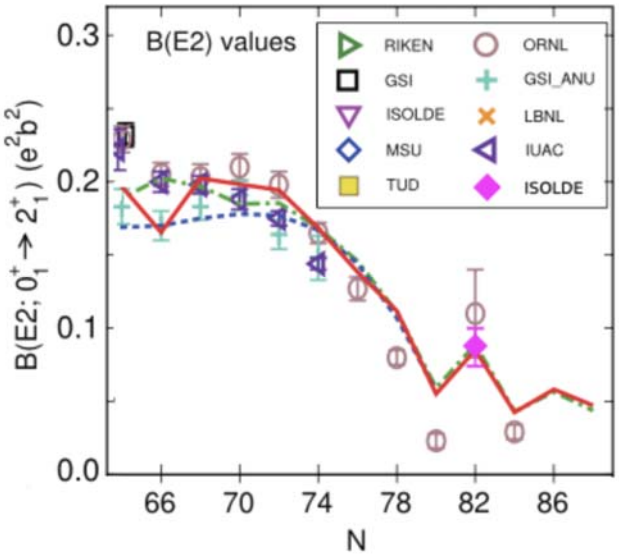


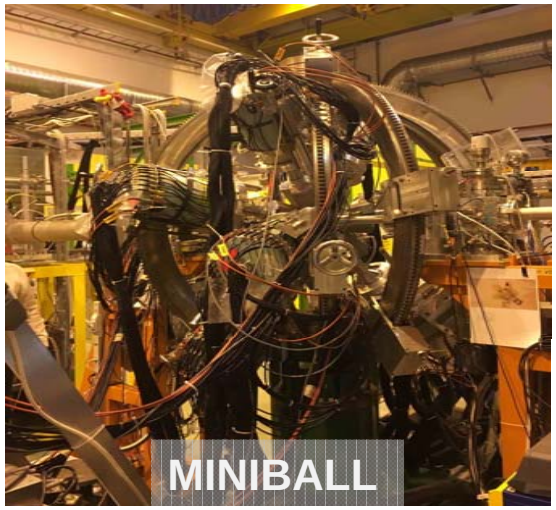


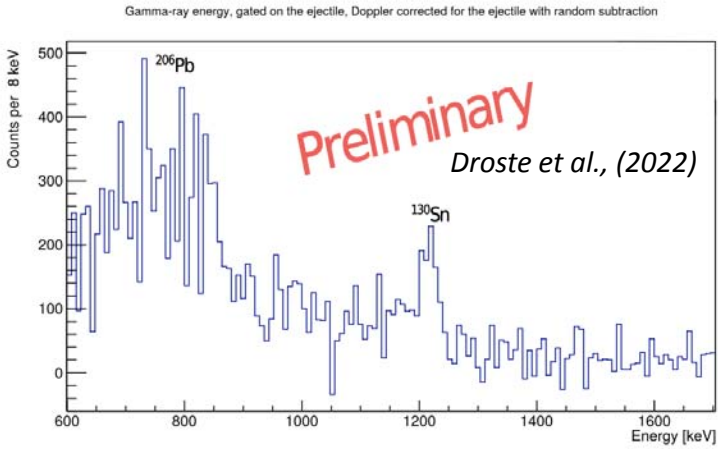
V. Manea et al., INTC-P-650 (2023)

HIE-ISOLDE: Coulomb excitation around ^{132}Sn with MINIBALL & REX

Togashi et al., (2018)







Droste et al., (2022)

Measure ^{130}Sn -> ^{134}Sn Coulex and compare with lifetime measurements
Addendum IS-702: ^{130}Sn experiment (2023, tbs), new experiment ^{134}Sn (2024)

IS-702: Probing the doubly magic ^{132}Sn shell closure by Coulomb excitation of neutron-rich ^{130,134}Sn

P. Reiter (U. Cologne) T. Kröll (TU Darmstadt)

Request 2024

R. Lozeva, V. Piau

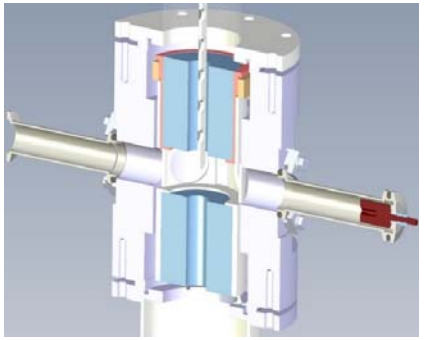
2 travels + 2 weeks mission = 2.5 k€

Nuclear moments of excited states in n-rich Sn isotopes studied by on-line PAC (IS673)

G. Georgiev (co-spokesperson) + K. Stoychev, D. Yordanov + collaboration with SS physics

On-line TDPAC – nuclear moments of very short lived (5 – 10 ns) isomers

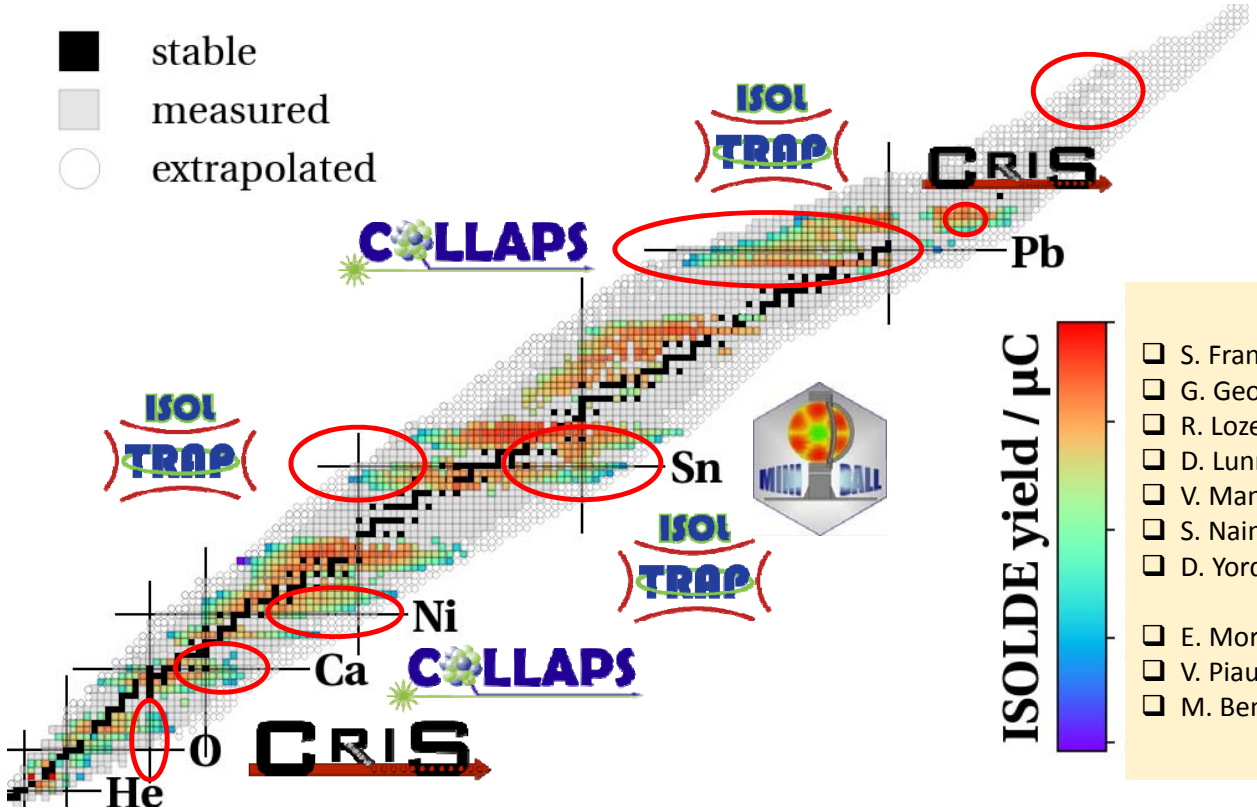
- New setup presently being constructed :
  - **Permanent magnets (ordered)** – in collaboration with D. Sakellariou (KU Leuven), presently being tested, ***IN2P3 funded***
  - **Vacuum chamber** – collaboration IJCLab (design)/IFIN Bucharest (manufacturing) mechanical and vacuum elements purchased (***funded by ISOLDE SSP collaboration***) presently in the ***being manufactured*** in Bucharest
  - **Target control system** – collaboration with ELI-NP Bucharest
  - **Integration within the IDS** (ISOLDE decay station) collaboration foreseen in 2023 (2nd half) – 2024



Request: 11 kE (missions) + 4 kE (equip)

I239 (G. Georgiev/G. Rainovski) – Seniority vs. alpha-clustering in the Po isotopes – endorsed by the INTC

ISOLDE SUMMARY



- ❑ S. Franchoo
- ❑ G. Georgiev
- ❑ R. Lozeva
- ❑ D. Lunney
- ❑ V. Manea
- ❑ S. Naimi
- ❑ D. Yordanov

- ❑ E. Morin
- ❑ V. Piau
- ❑ M. Benhatchi

Demande 2023

Missions (27 weeks):	25 k€
Fonctionnement:	8.5 k€
Equipement (TDPAC):	25 k€
TOTAL	58.5 k€ (rcvd 35 k€)

Demande 2024

Missions (26 weeks):	**32.5 k€**	
Equipement (TDPAC):	**4 k€**	***
TOTAL	**36.5 k€**	