



Nuclear Physics

Nuclear Structure experiments at ISOLDE
and other laboratories

for the period 2017 – 2025

Senior Assist. Prof. Dr. Diana Kocheva, University of Sofia

Nuclear physics

Sofia University St. Kliment Ohridski

Senior researchers

- Prof. Dr. Georgi Rainovski
- Assoc. Prof. Dr. Kalin Gladnishki
- Senior Assist. Prof. Dr. Diana Kocheva
- Senior Assist. Prof. Dr. Martin Djongolov
- Assoc. Prof. Dr. Stefan Lalkovski

Field of interest

- Seniority-type excitations
- Transition from single-particle to collective excitations
- Dynamic symmetries in atomic nuclei
- Nuclei in the region above double-magic nucleus ^{208}Pb
 - *Lifetime measurements*
 - *Coulomb excitation experiments*
 - *g-factor measurements*

Students

- Ivan Anastasov (in the group 2023/**present**)
CERN summer student 2024 / CERN roadmap funding - summer internship 2023
- Diyana Hristova (in the group 2023/**present**)
- Veselin Manov (in the group 2021/24)
ELI-NP, PhD student
- Ralitsa Mancheva (in the group 2018/19)
CERN summer student 2019 / CERN technical student 2020 / **KU Leuven, PhD student**
- Konstantin Stoychev (in the group 2017/20)
CERN summer student 2018 / **University of Guelph, Postdoc student**
- Desislava Kalaydjieva (in the group 2017/20)
CERN summer student 2019 / **University of Guelph, Postdoc student**
- Aleksandrina Yaneva (in the group 2017/20)
GSI-FAIR/IKP Cologne recently PhD defended
- Radostina Zidarova (in the group 2017/19)
CERN summer student 2017 / **TU Darmstadt recently PhD defended**
- Milena Stoyanova (in the group 2017/23)
University of Sofia PhD defended

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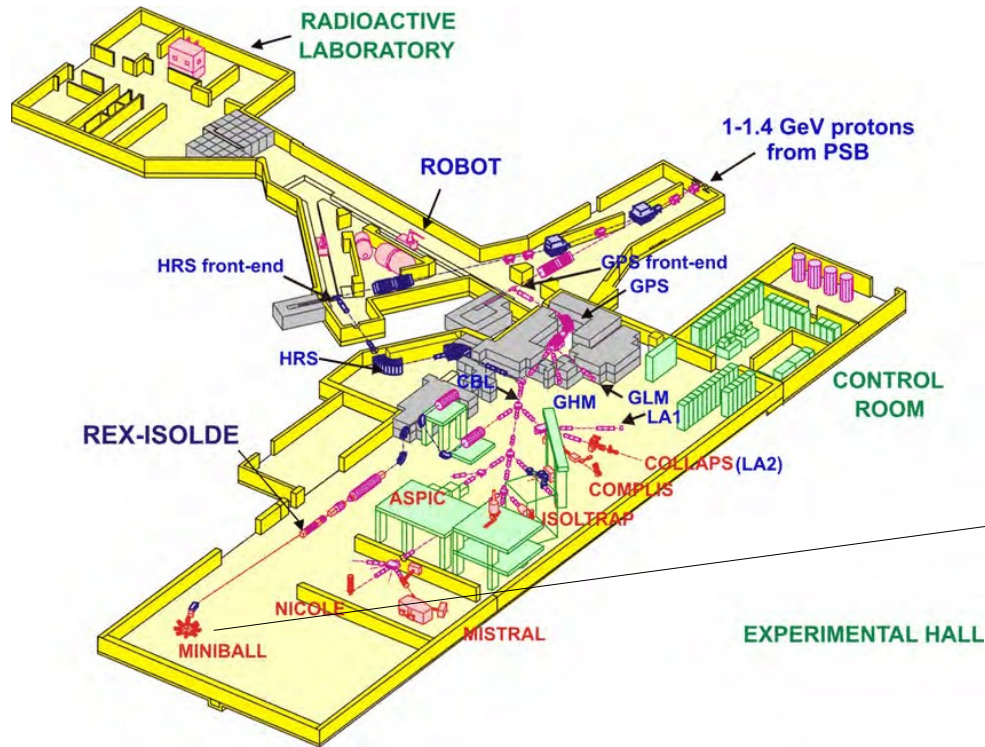
Field of interest

206Ra	207Ra	208Ra	209Ra	210Ra	211Ra	212Ra	213Ra	214Ra	215Ra	216Ra
205Fr	206Fr	207Fr	208Fr	209Fr	210Fr	211Fr	212Fr	213Fr	214Fr	215Fr
204Rn	205Rn	206Rn	207Rn	208Rn	209Rn	210Rn	211Rn	212Rn	213Rn	214Rn
203At	204At	205At	206At	207At	208At	209At	210At	211At	212At	213At
202Po	203Po	204Po	205Po	206Po	207Po	208Po	209Po	210Po	211Po	212Po
201Bi	202Bi	203Bi	204Bi	205Bi	206Bi	207Bi	208Bi	209Bi	210Bi	211Bi
200Pb	201Pb	202Pb	203Pb	204Pb	205Pb	206Pb	207Pb	208Pb	209Pb	210Pb
199Tl	200Tl	201Tl	202Tl	203Tl	204Tl	205Tl	206Tl	207Tl	208Tl	209Tl

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Nuclear structure experiments at ISOLDE

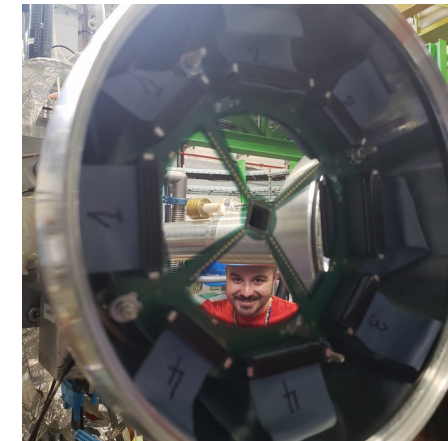
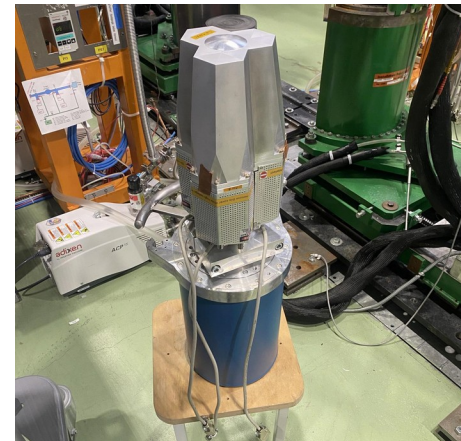


The Miniball spectrometer



Germanium cluster

DSSSD



Experiments in the frame of this program

IS546, IS551, IS553, IS559, IS562, IS596, IS656,
IS685, IS697, IS702, IS748, IS756

“A study of seniority-2 configurations in $N=126$ and 124 isotonic chains”

Performed september 2024

Spokesperson: G. Rainovski (Sofia University) & G. Georgiev (University Paris-Saclay)

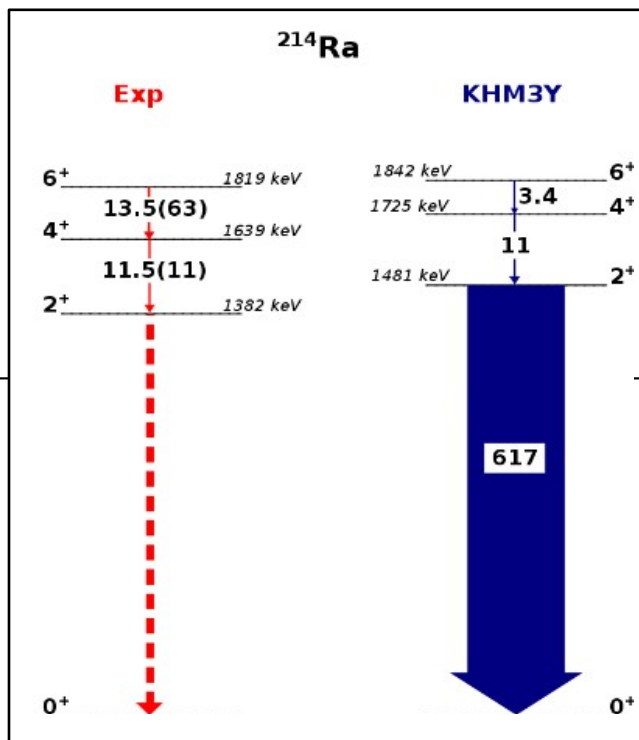
→ IS720 approved 2022

→ L239



Main problem: To many accepted experiments at ISOLDE are waiting to be performed!

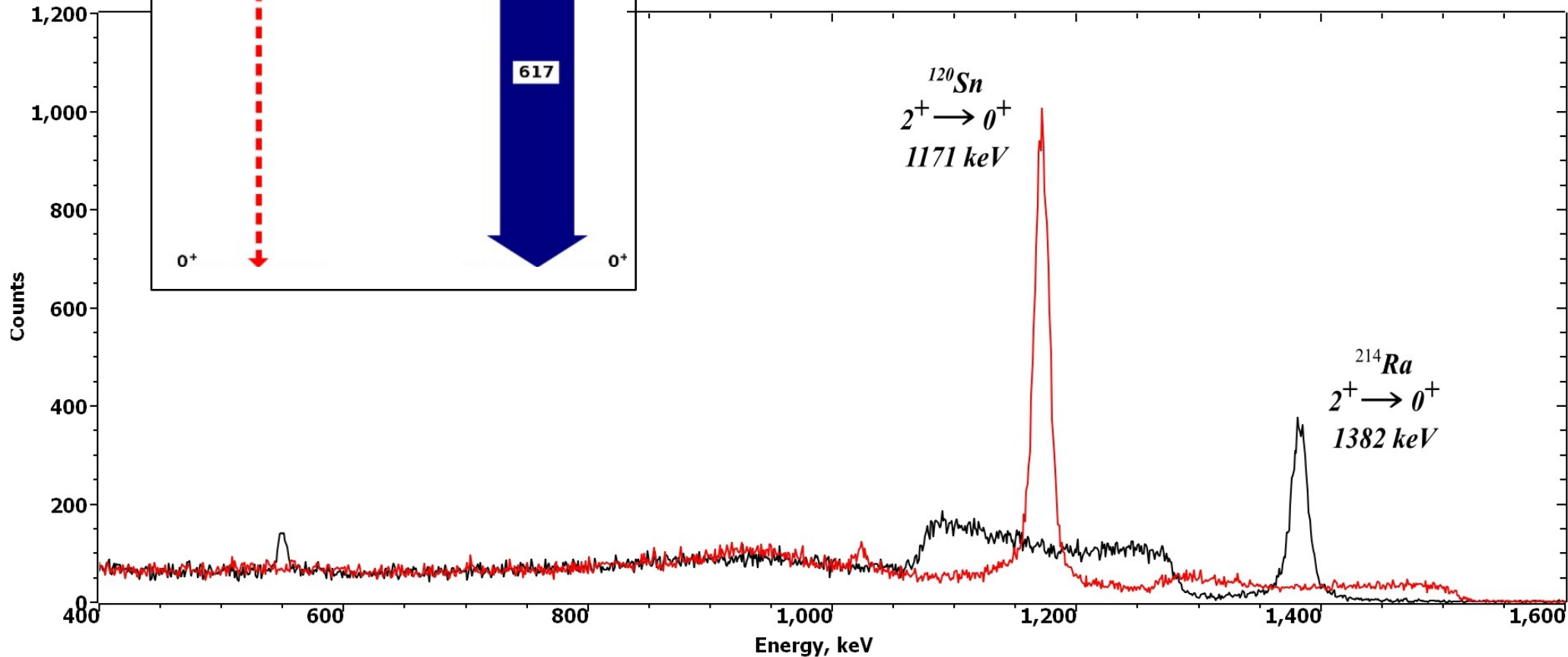
A study of seniority-2 configurations in N=126 and 124 isotonic chains



$^{120}\text{Sn} (^{214}\text{Ra}, ^{214}\text{Ra}^*)^{120}\text{Sn}^* @ 4.5\text{MeV/u}$

$^{120}\text{Sn} (^{212}\text{Ra}, ^{212}\text{Ra}^*)^{120}\text{Sn}^* @ 4.5\text{MeV/u}$

The analysis is ongoing.



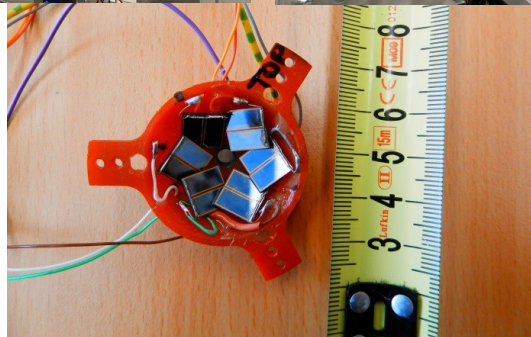
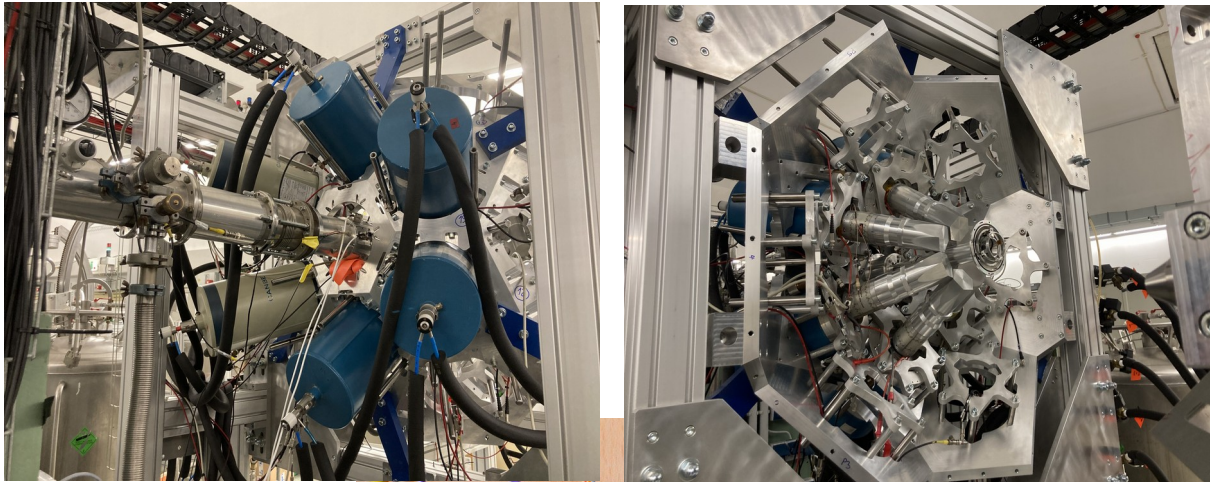
This study is supported by the National Roadmap for Research Infrastructures (object CERN).

Nuclear structure experiments at other laboratories

IKP Cologne – 8 experiments from 2017 to 2025

Transfer reactions' experiments around the double-magic ^{208}Pb

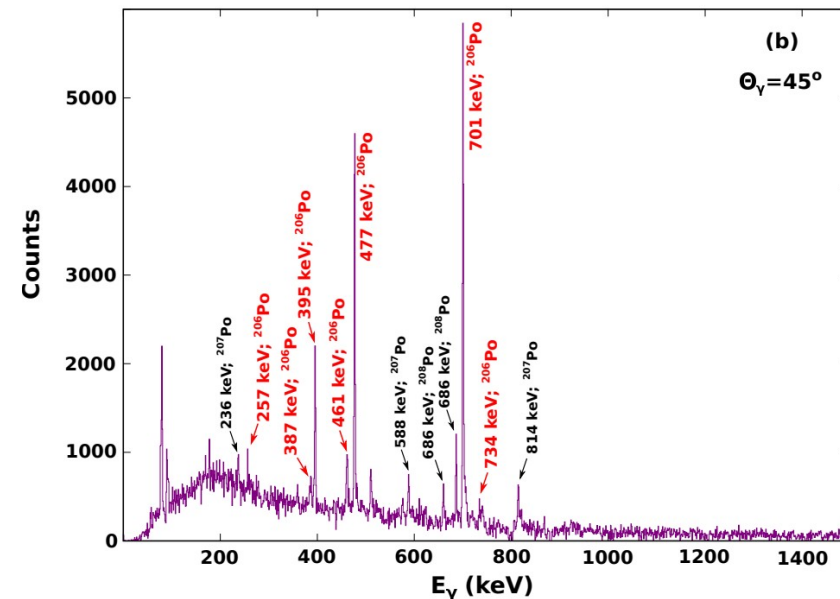
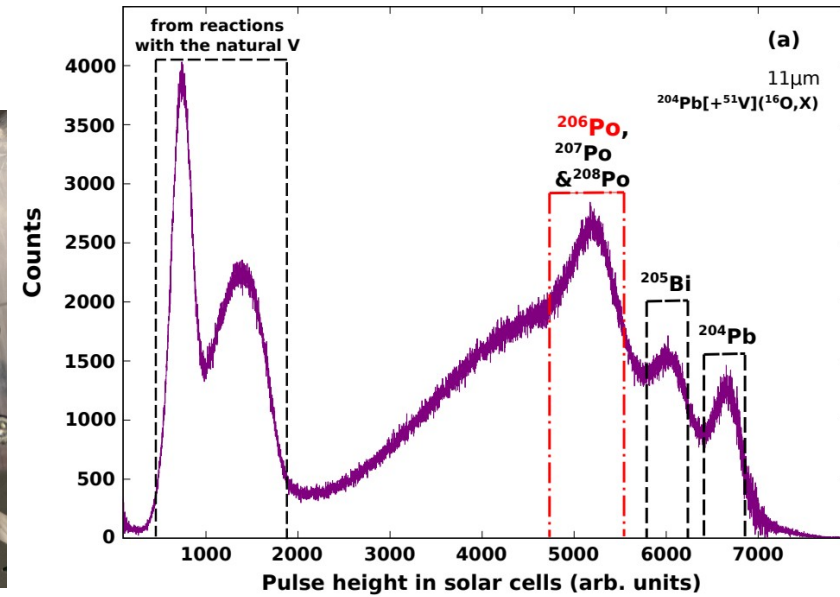
Tandem facility at IKP, Cologne



Other involvements: >10 experiments

- IFIN-HH, Măgurele, Romania
- GANIL, Caen, France
- JCLab, Orsay, France

D. Kocheva et. al., Phys. Scr. 99 065307 (2024)



Funding

- National Roadmap for Research Infrastructures (object CERN) since 2021
- DAAD Bilateral Partnership Agreement between the University of Sofia and University of Cologne, 6 weeks per year (2017-2025)
- Bulgarian National Science Fund in the framework of the contract KP-06-Rila12 (2021-2024) ~6kEUR
- Bulgarian National Science Fund in the framework of the contract KP-06-M28/1 (2018-2021) ~ 10kEUR
- Bulgarian National Science Fund in the framework of the contract DN08/23 (2016-2020) ~ 60kEUR
- Bulgarian National Science Fund in the framework of the contract KP-06-N68/8 (2022-2027) ~ 90kEUR
- APRENDE an Euratom project №101164596 (2024-2028) budget for SU: 63 kEUR
- SANDA an Euratom project №847552 (2019-2024) budget for SU: 20 kEUR
- SUMMIT - National Recovery and Resilience Plan of the Republic of Bulgaria, project number BG-RRP-2.004-0008-C01 since 2023
- Nuclear Data for Astrophysics and Applications, a Fulbright project №22-21-05, 30.05 2022, budget: 10.7k\$

Publications

Total: 67 papers for the period 2017-2025

Quartile Q1: 54 papers

Quartile Q2: 4 papers

Others: 9 papers

Thank you for your attention!