Bulgarian ISOLDE community and membership

Georgi Rainovski

SOFIA UNIVERSITY
ST. KLIMENT OHRIDSKI

Nuclear physics research in Bulgaria

Sofia University St. Kliment Ohridski

Faculty of Physics

Founded 1888

- Covers practically all scientific fields;
- 16 faculties;
- 2700 staff;
- 22000-23000 students;

Faculty of Physics

- Academic staff ~110;
- 12 Departments;

Department of Atomics Physic and Nuclear Engineering

- 12 BSc/18 MSc/10 Phd programs;

Nuclear and Particle Physics

- Students ~ 600 students (50 PhD);

Bulgarian Academy of Science

Institute of Nuclear Research and Nuclear Energy

13 – departments/laboratories
Academic staff ~300
Fundamental nuclear physics research (theory&experiment);
High energy physics;
Applied nuclear physics studies;
Nuclear reactor physics;
Nuclear medicine;

Project for building up National Cyclotron Centre
TR 24 (Advanced Cyclotron Systems Inc.) - production and research of SPEC and PET radioisotopes

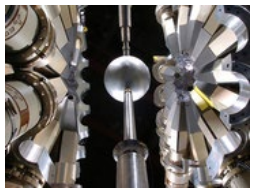
Nuclear physics in Bulgaria

There are no operational facilities in Bulgaria ⇒ main activities are carried out abroad

International collaborations

Argonne NATIONAL LABORATORY

ATLAS
Gammasphere



FAIR@GSI

NUSTAR - HISPEC

AGATA ADVANCED GAMMA TRACKING ARRAY

IKP

INFN Laboratori Nazionali di Legnaro

GASP, SPES

IPN INSTITUT DE PHYSIQUE NUCLÉAIRE ORSAY

IFIN-HH

TECHNISCHE UNIVERSITÄT DARMSTADT

CERN

ISOLDE

Bulgaria at CERN

Member state since 1999

but
officially participates only in one experiment - CMS

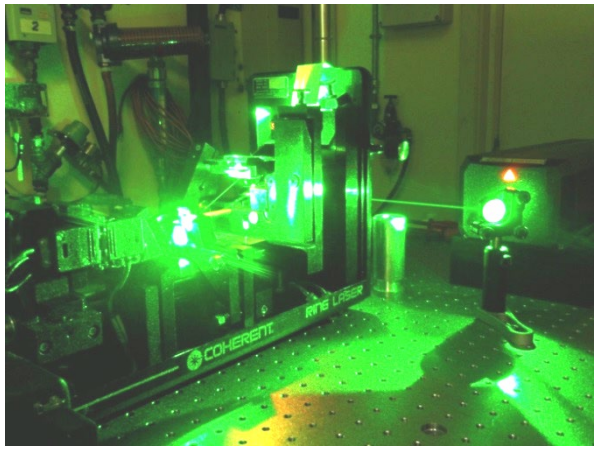
- group at the Department of Atomic Physics and Nuclear engendering, Faculty of Physics, Sofia University
- group at Institute of Nuclear Research and Nuclear Energy, Bulgarian academy of science

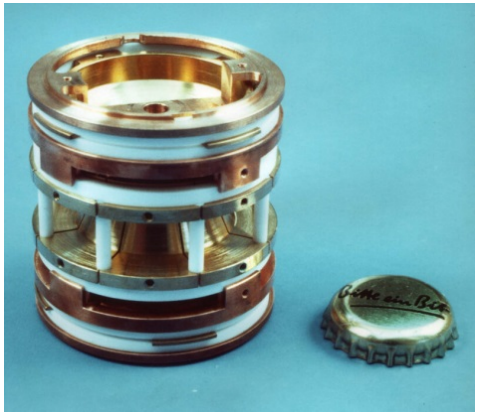
From 1999 there were attempts to join other experiments and ISOILDE always has been first in the list.

Bulgarians at ISOLDE experiments

COLLAPS

Prof. Krasimira Marinova (JINR)
Prof. Dimiter Balabanski (ELI-NP)
Dr. Deyan Yordanov (CSNSM Orsay)



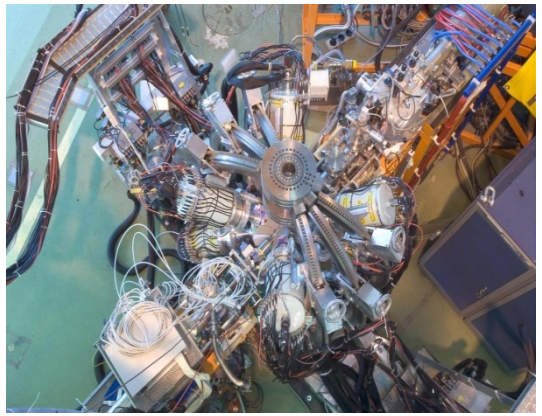


ISOLTRAP

Dinko Atanasov
(TU Dresden)

REX-ISOLDE, MINIBALL

Prof. Dimiter Balabanski (ELI-NP, Bucharest)
Dr. Georgi Georgiev (CSNSM Orsay)
Dr. Andrej Blazhev (Uni Köln)
Prof. Georgi Rainovski (Uni Sofia)
Assoc. Prof. Kalin Gladnishki (Uni Sofia)
Assist. Prof. Martin Djongolov (Uni Sofia)
Assist. Prof. Martin Djongolov (Uni Sofia)
Assoc. Prof. Elena Stefanova (INRNE Sofia)
Assist. Prof. Orlin Jordanov (INRNE Sofia)



Mössbauer spectroscopy at ISOLDE:

Dr. Petko Krastev
(INRNE Sofia)

Bulgarians at ISOLDE experiments

Study of the effect of shell stabilization of the collective isovector valence-shell excitations along the N=80 isotonic chain – **IS496 & IS546**
(TU Darmstadt – UNI Sofia)

Quantitative identification of 2^+ MSSs of ^{140}Nd and ^{142}Sm via measurement of absolute B(M1) strengths

RAPID COMMUNICATIONS

PHYSICAL REVIEW C **88**, 021302(R) (2013)

Local suppression of collectivity in the $N = 80$ isotones at the $Z = 58$ subshell closure

C. Bauer,[1,*] G. Rainovski,[2] N. Pietralla,[1] D. Bianco,[3,4,†] A. Blazhev,[5] T. Bloch,[1] S. Bönig,[1] A. Damyanova,[2,6] M. Danchev,[2] K. A. Gladnishki,[2] T. Kröll,[1] J. Leske,[1] N. Lo Iudice,[3,4] T. Möller,[1] K. Moschner,[5] J. Pakarinen,[7,8] P. Reiter,[5] M. Scheck,[1,‡] M. Seidlitz,[5] B. Siebeck,[5] C. Stahl,[1] R. Stegmann,[1] T. Stora,[7] Ch. Stoyanov,[9] D. Tarpanov,[9] M. J. Vermeulen,[10] D. Voulot,[7] N. Warr,[5] F. Wenander,[7] V. Werner,[11] and H. De Witte[12]

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[4]*Istituto Nazionale de Fisica Nucleare, Sezione di Napoli, Napoli, Italy*
[5]*Institut für Kernphysik, Universität zu Köln, Köln, Germany*
[6]*University of Genève, Genève, Switzerland*
[7]*CERN, Genève, Switzerland*
[8]*University of Jyväskylä, Jyväskylä, Finland*
[9]*Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Science, Sofia, Bulgaria*
[10]*Department of Physics, University of York, York, United Kingdom*
[11]*WNSL, Yale University, New Haven, Conneticut, United States*
[12]*Instituut voor Kern- en Stralingsfysica, KU Leuven, Leuven, Belgium*

PHYSICAL REVIEW C **91**, 054326 (2015)

Evolution of quadrupole collectivity in $N = 80$ isotones toward the $Z = 64$ subshell gap: The $B(E2; 2_1^+ \rightarrow 0_1^+)$ value of ^{142}Sm

R. Stegmann,[1,*] C. Bauer,[1] G. Rainovski,[2] N. Pietralla,[1] C. Stahl,[1] S. Bönig,[1] S. Ilieva,[1] A. Blazhev,[3] A. Damyanova,[2,4] M. Danchev,[2] K. Gladnishki,[2] J. Jolie,[3] R. Lutter,[5] J. Pakarinen,[6,7] D. Radeck,[3] E. Rapisarda,[6,8] P. Reiter,[3] M. Scheck,[9,10] B. Siebeck,[3] T. Stora,[6] P. Thöle,[3] T. Thomas,[3] M. Thürauf,[1] M. J. Vermeulen,[11] D. Voulot,[6] N. Warr,[3] F. Wenander,[6] V. Werner,[1,12] and H. De Witte[8]

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[4]*University of Genève, CH-Genève, Switzerland*
[5]*Fakultät für Physik, Ludwig-Maximilians-Universität München, D-Garching, Germany*
[6]*CERN, CH-Genève, Switzerland*
[7]*University of Jyväskylä, FIN-Jyväskylä, Finland*
[8]*Instituut voor Kern- en Stralingsfysica, KU Leuven, B-Leuven, Belgium*
[9]*School of Engineering, University of the West of Scotland, Paisley, PA1 2BE, United Kingdom*
[10]*SUPA, Scottish University Physics Alliance, Glasgow, G12 8QQ, United Kingdom*
[11]*Nuclear Physics Group, Department of Physics, University of York, York, United Kingdom*
[12]*WNSL, Yale University, New Haven, Connecticut 06520, USA*

PHYSICAL REVIEW C **102**, 041304(R) (2020)

Rapid Communications

Restoring the valence-shell stabilization in ^{140}Nd

R. Kern,[1,*] R. Zidarova,[1,2] N. Pietralla,[1] G. Rainovski,[2] R. Stegmann,[1] A. Blazhev,[3] A. Boukhari,[4] J. Cederkäll,[4,5] J. G. Cubiss,[6] M. Djongolov,[2] C. Fransen,[3] L. P. Gaffney,[4,7] K. Gladnishki,[2] E. Giannopoulos,[4,8,9] H. Hess,[3] J. Jolie,[3] V. Karayonchev,[3] L. Kaya,[3] J. M. Keatings,[10,11] D. Kocheva,[2] Th. Kröll,[1] O. Möller,[1] G. G. O'Neill,[12,13] J. Pakarinen,[8,9] P. Reiter,[3] D. Rosiak,[3] M. Scheck,[10,11] J. Snall,[5] P.-A. Söderström,[1,14] P. Spagnoletti,[10,11] M. Stoyanova,[2] S. Thiel,[3] A. Vogt,[3] N. Warr,[3] A. Welker,[4] V. Werner,[1] J. Wiederhold,[1] and H. De Witte[15]

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[4]*ISOLDE, CERN, 1211 Geneva 23, Switzerland*
[5]*Department of Nuclear Physics, University of Lund, 221 00 Lund, Sweden*
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[8]*Helsinki Institute of Physics, University of Helsinki, P.O. Box 64, FIN-00014 Helsinki, Finland*
[9]*Department of Physics, University of Jyvaskyla, P.O. Box 35, 40014 Jyvaskyla, Finland*
[10]*CEPS, University of the West of Scotland, Paisley PA1 2BE, United Kingdom*
[11]*SUPA, Scottish Universities Physics Alliance, United Kingdom*
[12]*Department of Physics, University of Western Cape, Bellville 7535, South Africa*
[13]*iThemba LABS, National Research Foundation, Somerset West 7129, South Africa*
[14]*Extreme Light Infrastructure-Nuclear Physics (ELI-NP)/Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, Strasse Reactorului 30, 077125 Bucharest-Magurele, Romania*
[15]*Instituut voor Kern- en Stralingsfysica, K.U. Leuven, 3001 Leuven, Belgium*

Bulgarian students at CERN and ISOLDE

2 positions for Bulgarian students in CERN summer school

Stanislav Dimitrov (2021 – ISOLDE ?)
Ralitsa Mancheva (2019 – ISOLDE, MSc student at Sofia & technical student at CERN)
Desislava Kalaydjieva (2019 – root group, PhD student at CEA, Saclay)
Konstatntin Stoychev (2018 – CMS comp., PhD student at CSNSM Orsay)
Radostina Zidarova (2017 – ISOLDE, PhD student at Darmstadt)
Bozidar Dimitrov (2015 – ISOLDE, PhD student at INRNE)
Maria Trichkova (2014 – ISOLDE, Westinghouse, Sofia)
Vasil Karayonchev (2013 – ISOLDE, PhD student at Uni Köln)
Antoaneta Damyanova (2011 – ISOLDE, PhD student at Uni Geneva)

Bulgaria at ISOLDE

- Bulgarian Nuclear physics community is relatively small but vital;
- The involvement of Bulgarian scientist in ISOLDE experiments is long standing and visible but it is mostly personal rather than institutional one;

Funding

- National funding – National Science Fund (severely limited, excludes funding for long-term involvements, **unpredictable funding cycles**)
  - 2009 – 2012 partial support ~ 5 k€ (grant DO 02/219);
  - 2017 – 2019 partial support ~ 10 k€ (grant DN 08/23);
- External funding – Alexander von Humboldt foundation and ENSAR TNA06 – in total ~ 7 k€ for the period 2012 - 2015;
- CERN support – 6 summer students (2011-2019), 1 CAS (2016);

Attempts to join ISOLDE and other experiments

- Two unsuccessful attempts in 2014 and 2016;
- In 2017 ECFA strongly recommended that Bulgarian government should introduce an appropriate funding scheme that allows for joining other experiments including ISOLDE;

National roadmap for research infrastructures 2020 - 2027

- National projection of ESFRI roadmap;
- Includes 50 domestic and international laboratories;
- For nuclear physics – CERN, JINR Dubna and National cyclotron center;

Consortium "Bulgaria at CERN"

- Partners – Sofia University and INRNE, BAS;
- Scientific coordinator – Sofia University, party to the MoUs;
- Budget for 2021 – 250 k€ (the budget for next years will be decided upon annual performance evaluation);
- Evaluation criteria – number of experiments in which Bulgarian scientist are involved, number of attracted students, PhD students, and young scientist;
- Main goals:
  - to officially join ISOLDE, ALICE, and NA61;
  - to provide more stable financing for Bulgarian teams involved in these experiments;
  - to allow more Bulgarian scientist and students to become involved and to assume more active roles and responsibilities;
  - to provide the infrastructure at home need for our participation at CERN (detector laboratories, electronics workshops etc.);

Hereby we apply for membership at ISOLDE on a reduced fee (30 000 CHF) from 2021