HIL

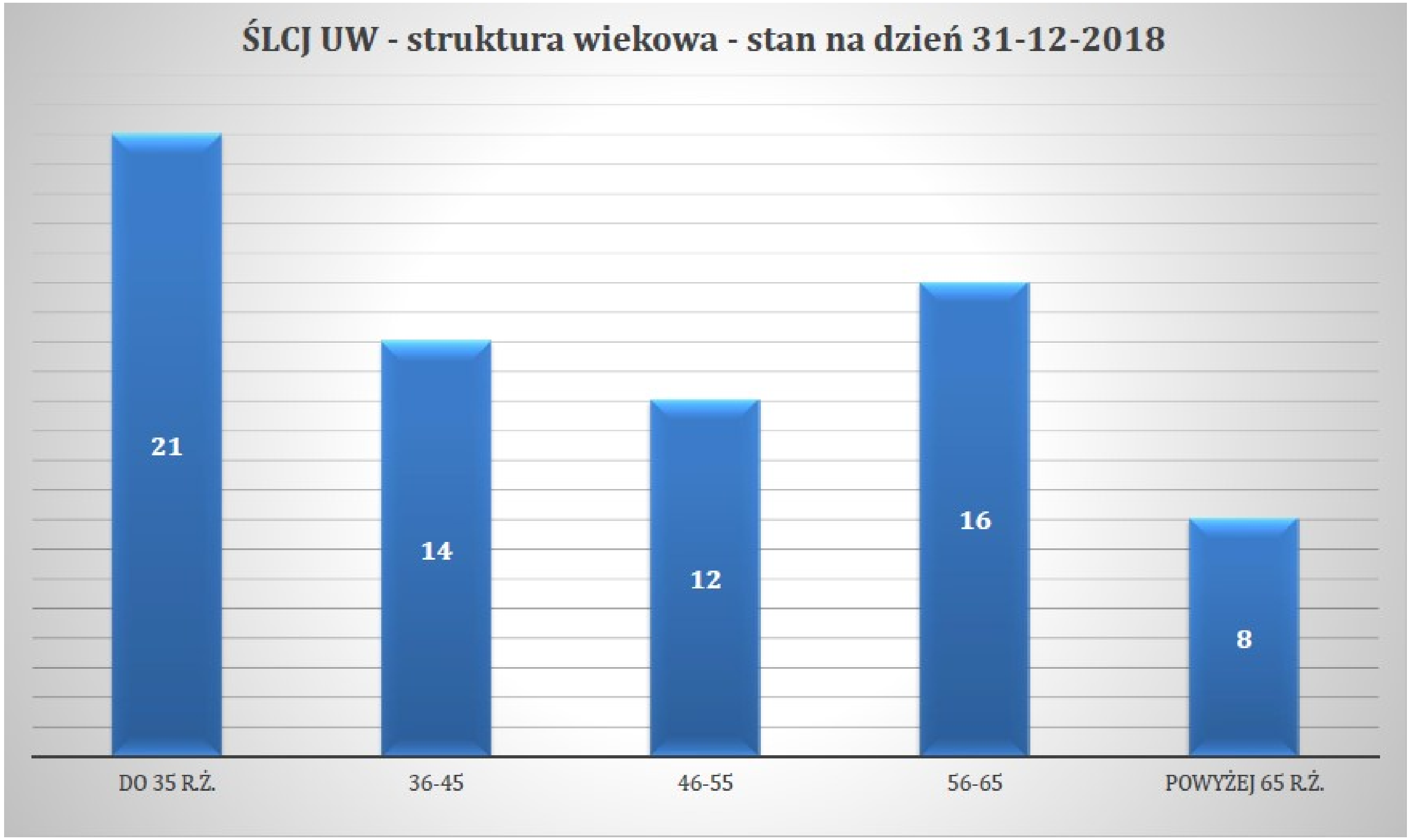
- The largest nuclear physics lab. in Poland, open for external users
- Involved in teaching
- Developing medical applications

Staff 2019

Senior scientists 8
Scientific staff and engineers 28
PhD students 5
Technicians 18
Administration and support 16

HIL

Staff, end of 2018



Scientific Programme

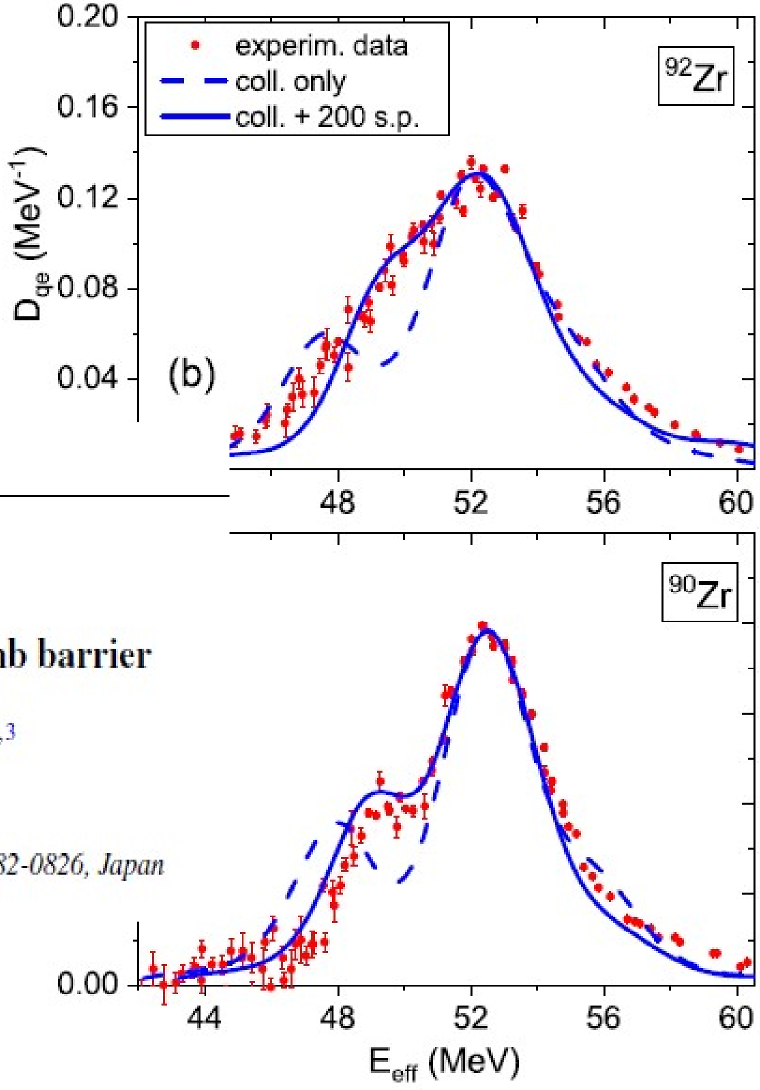
Coordinated by PAC (presently 10 members, chaired by Prof. W.H. Trzaska, meetings twice a year)

Topics:

1. Mechanism of nuclear reactions and Coulomb barrier distributions (Dr. A. Trzcińska + 9, 15 publications in 2019)
2. Nuclear excited states investigated using multi-detector arrays (Dr. hab. M.Palacz + 11, papers see below),
3. Nuclear deformations studied by means of Coulomb excitation method (Dr. P. Napiorkowski + 9, 2+3 = 19 papers in 2019)
4. Radiobiology and nano-dosimetry (Dr. U. Kaźmierczyk + 3, 2 papers in 2019)
5. Properties of medical radioisotopes produced by means of particle accelerators (Dr. J. Choiński + 4, 11 papers in 2019)
6. Accelerator Physics (P. Gmaj + 5, 1 paper in 2019)

„Highlights” 2019

$^{20}Ne+Zr$



PHYSICAL REVIEW C **100**, 014616 (2019)

Dissipation and tunneling in heavy-ion reactions near the Coulomb barrier

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PHYSICAL REVIEW C **100**, 014330 (2019)

Lifetime of the recently identified 10^+ isomeric state at 3279 keV in the ^{136}Nd nucleus

A. Tucholski,[1] Ch. Droste,[2] J. Srebrny,[1] C. M. Petrache,[3] J. Skalski,[4] P. Jachimowicz,[5] M. Fila,[2] T. Abraham,[1] M. Kisieliński,[1] A. Kordyasz,[1] M. Kowalczyk,[1] J. Kownacki,[1] T. Marchlewski,[1] P. J. Napiorkowski,[1] L. Próchniak,[1] J. Samorajczyk-Pyśk,[1] A. Stolarz,[1] A. Astier,[3] B. F. Lv,[3] E. Dupont,[3] S. Lalkovski,[6] P. Walker,[7] E. Grodner,[4] and Z. Patyk[4]

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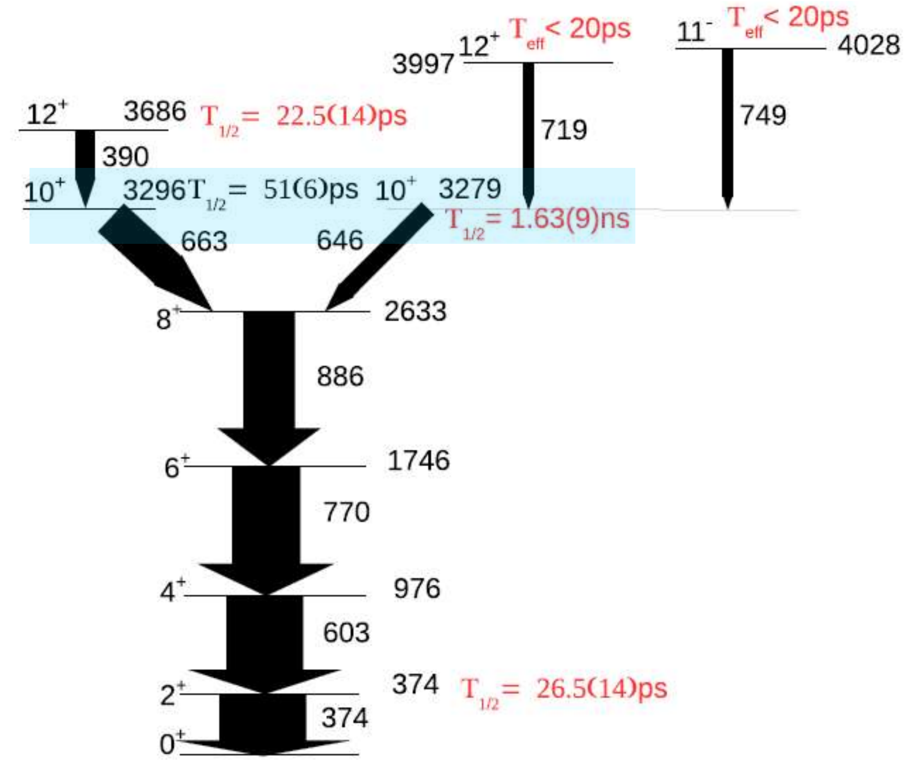
[5]*Faculty of Physics and Astronomy, University of Zielona Gora, Licealna 9, 65-417 Zielona Gora, Poland*
[6]*Nuclear Engineering, Faculty of Physics, Sofia University "St. Kl. Ohridski", 5 James Bourchier Boulevard, Sofia 1164, Bulgaria*
[7]*Department of Physics, University of Surrey, Guildford GU2 7XH, United Kingdom*



PHYSICAL REVIEW C **97**, 024326 (2018)

Quadrupole collectivity in ^{42}Ca from low-energy Coulomb excitation with AGATA

K. Hadyńska-Klęk,[1,2,3,4,5,*] P. J. Napiorkowski,[1] M. Zielińska,[1,6] J. Srebrny,[1] A. Maj,[7] F. Azaiez,[8] J. J. Valiente Dobón,[4] M. Kicińska-Habior,[2] F. Nowacki,[9] H. Naïdja,[9,10,11] B. Bounthong,[9] T. R. Rodríguez,[12] G. de Angelis,[4] T. Abraham,[1] G. Anil Kumar,[7] D. Bazzacco,[13,14] M. Bellato,[13] D. Bortolato,[13] P. Bednarczyk,[7] G. Benzoni,[15] L. Berti,[4] B. Birkenbach,[16] B. Bruyneel,[16] S. Brambilla,[15] F. Camera,[15,17] J. Chavas,[6] B. Cederwall,[18] L. Charles,[9] M. Ciemała,[7] P. Cocconi,[4] P. Coleman-Smith,[19] A. Colombo,[13] A. Corsi,[15,17] F. C. L. Crespi,[15,17] D. M. Cullen,[20] A. Czermak,[7] P. Désesquelles,[21,22]

fication of the low-spin level scheme of ^{42}Ca. A dedicated fusion-evaporation experiment was performed at the Heavy Ion Laboratory, University of Warsaw [38], using the EAGLE spectrometer [46] consisting of 15 high-purity germanium (HPGe) detectors equipped with anti-Compton BGO shields. Germanium detectors were placed at the following laboratory angles with respect to the beam direction: 25° (1 Ge detector), 38° (2), 63° (2), 90° (2), 117° (2), 142° (2), and 155° (1).

A ^{32}S beam of 80 MeV energy bombarded a 100-mg/cm^2-thick ^{12}C target. Significant production of ^{42}Ca was observed in the $2p$ reaction channel, although it led mostly to the population of states in the yrast band. The states in the sideband in ^{42}Ca, including the 2424-keV level, were populated in the β decay of ^{42}Sc, produced in the pn evaporation channel. In its ground state, ^{42}Sc has a

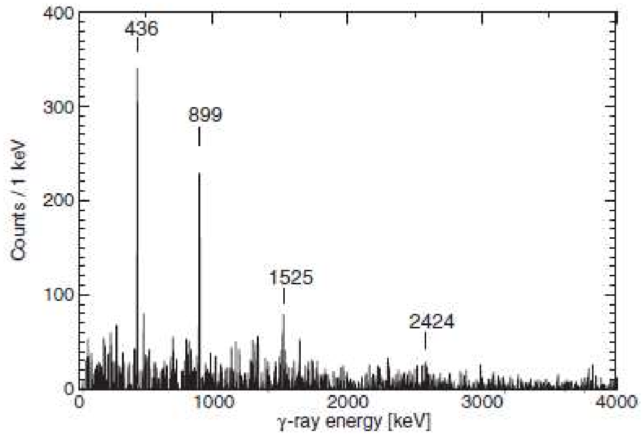


FIG. 7. The γ-ray spectrum collected in the $^{12}C + ^{32}S$ experiment, gated on the 328-keV transition deexciting 4_1^+ state in ^{42}Ca.

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Biological effects of mixed-ion beams. Part 2: The relative biological effectiveness of CHO-K1 cells irradiated by mixed- and single-ion beams

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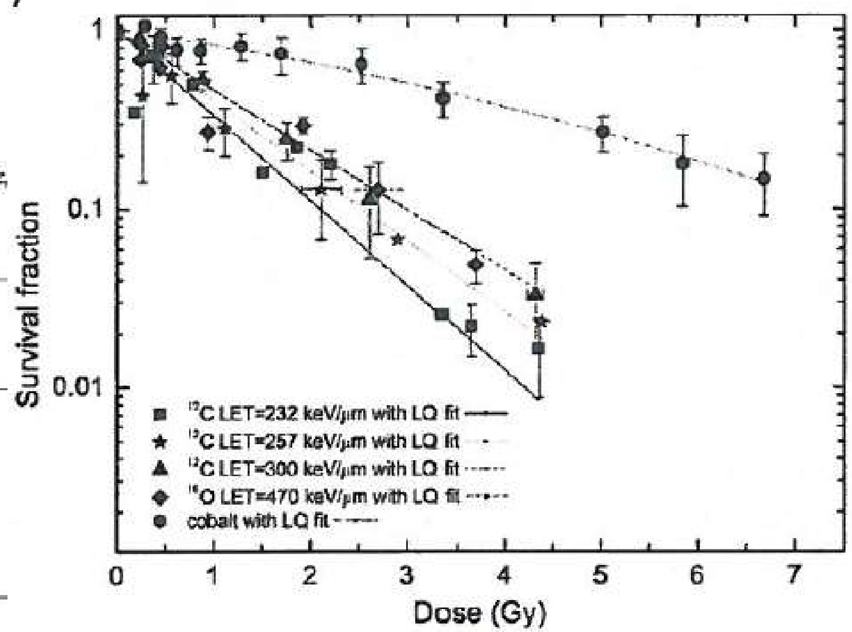
HIGHLIGHTS

- The relative biological effectiveness (RBE) of low-energy ions was estimated.
- RBE for the individual and mixed ^{12}C and ^{16}O beams was calculated.
- Survival fractions of the CHO-K1 cells after such irradiations are presented.
- At specific LET values, carbon and oxygen ions have equal RBEs.
- Survival fractions do not depend on the mixed beam composition.

i)



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Influence of metal ions on the ^{44}Sc-labeling of DOTATATE

Rafał Walczak[1] · Weronika Gawęda[1] · Jakub Dudek[1] · Jarosław Choiński[2] · Aleksander Bilewicz[1]

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Abstract

The aim of the study was to evaluate the labeling yield of ^{44}Sc-DOTATATE radiobioconjugate when the labeling is performed in the presence of various amounts of competing metallic impurities. In the case of Ca^{2+} and Al^{3+} the effect is irrelevant, which is understandable considering the low stability constant of Ca^{2+}-DOTA and Al^{3+}-DOTA complexes. However, the presence of $Fe^{2+/3+}$, Zn^{2+} and Cu^{2+} cations very strongly influences the efficiency of the ^{44}Sc-DOTATATE formation. Surprisingly, while the Zn^{2+}-DOTA stability constants is the smallest, Zn^{2+} cations competes more strongly with Sc^{3+} than $Fe^{2+,3+}$ and Cu^{2+} at the DOTATATE coordination site.

Irradiation of calcium target

Irradiations of the calcium targets were performed using the GE PETtrace cyclotron at the Radiopharmaceuticals Production and Research Centre put into operation by the Heavy Ion Laboratory, University of Warsaw a few years ago. This cyclotron was recently equipped with an external beam line for solid sample irradiations, also allowing a good cooling conditions for these samples [16]. A 2-h proton irradiation at the energy 16 MeV and 15 μA current were performed. During irradiation process the front side and the back side of the target were cooled.

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journal homepage: www.elsevier.com/locate/nima

EBIS debuncher experimental performance

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Continuous wave beam
Electron Beam Ion Source
EBIS
Radioactive ion beams

ABSTRACT

The recent test of a prototype of beam debuncher device for Electron Beam Ion Source (EBIS), designed within the EMILIE (Enhanced Multi-Ionization of short-Lived Ions for EURISOL) project, is presented in this paper. For a singly ionized Li^{+1} ion, high efficiency trapping times up to 1 s were established and a uniform ion extraction with intensity variation of less than 30% was achieved. The test gives promising results regarding the future introduction of debuncher devices to EBIS facilities.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme, France under grant agreement No. 654002. The authors would like to thank Dr Frederik Wenander and Dr. Yorick Blumenfeld for their precious support.

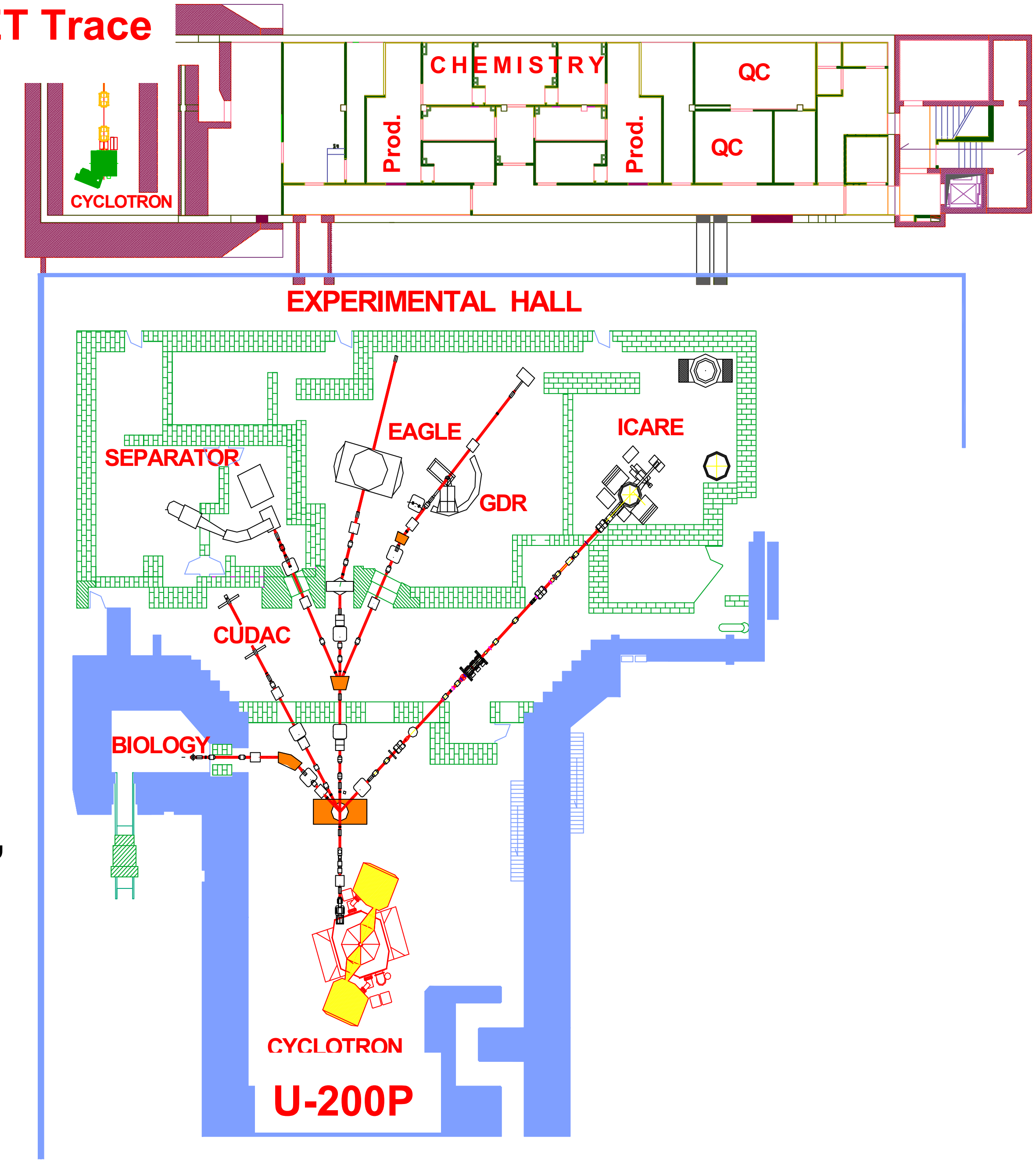
HIL

User Facility: ~ 100 users/year

Staff: ~ 75

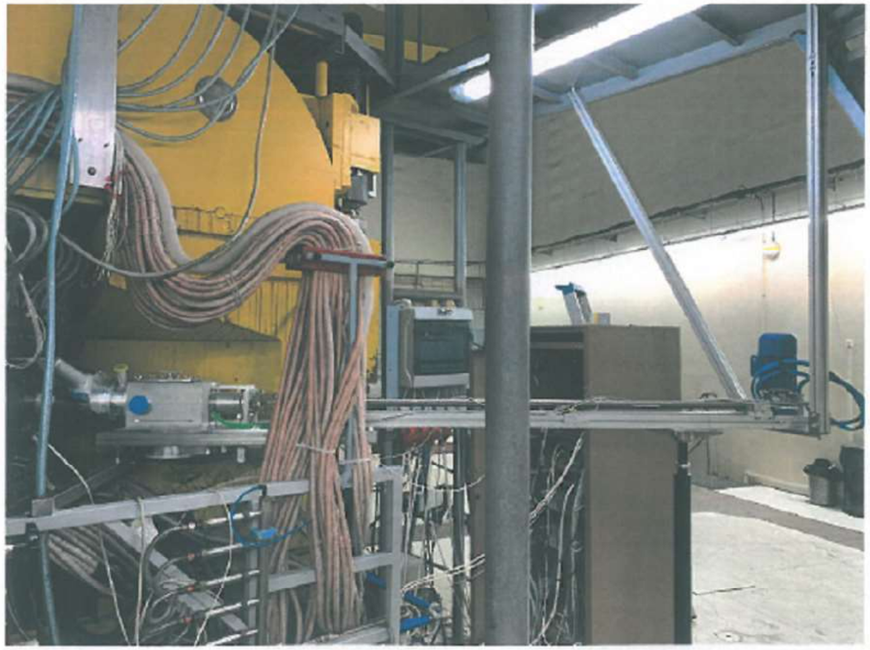
Two cyclotrons:

- U-200P heavy ion beams up to10 MeV*A, two ECR ion sources
- GE PET Trace, high intensity p/d (16/8 MeV)



Modernization (recent)

- New HF generators
- Beam line for irradiation of solid state targets with internal alpha-beam



Future

- coupling of the two cyclotrons and acceleration of radioactive beams

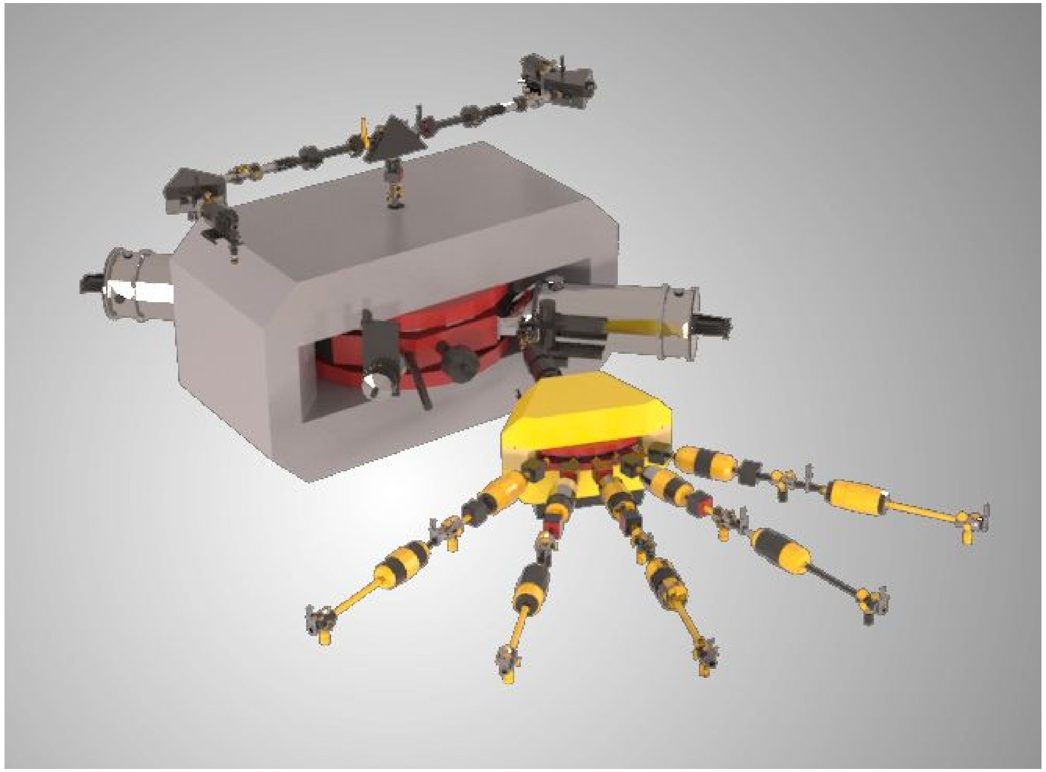
- New stable beams with increased intensity

- New HI cyclotron (DC-280 from Dubna?).

Beams ^{4}He - ^{209}Bi

Intensity up to 10 pμA

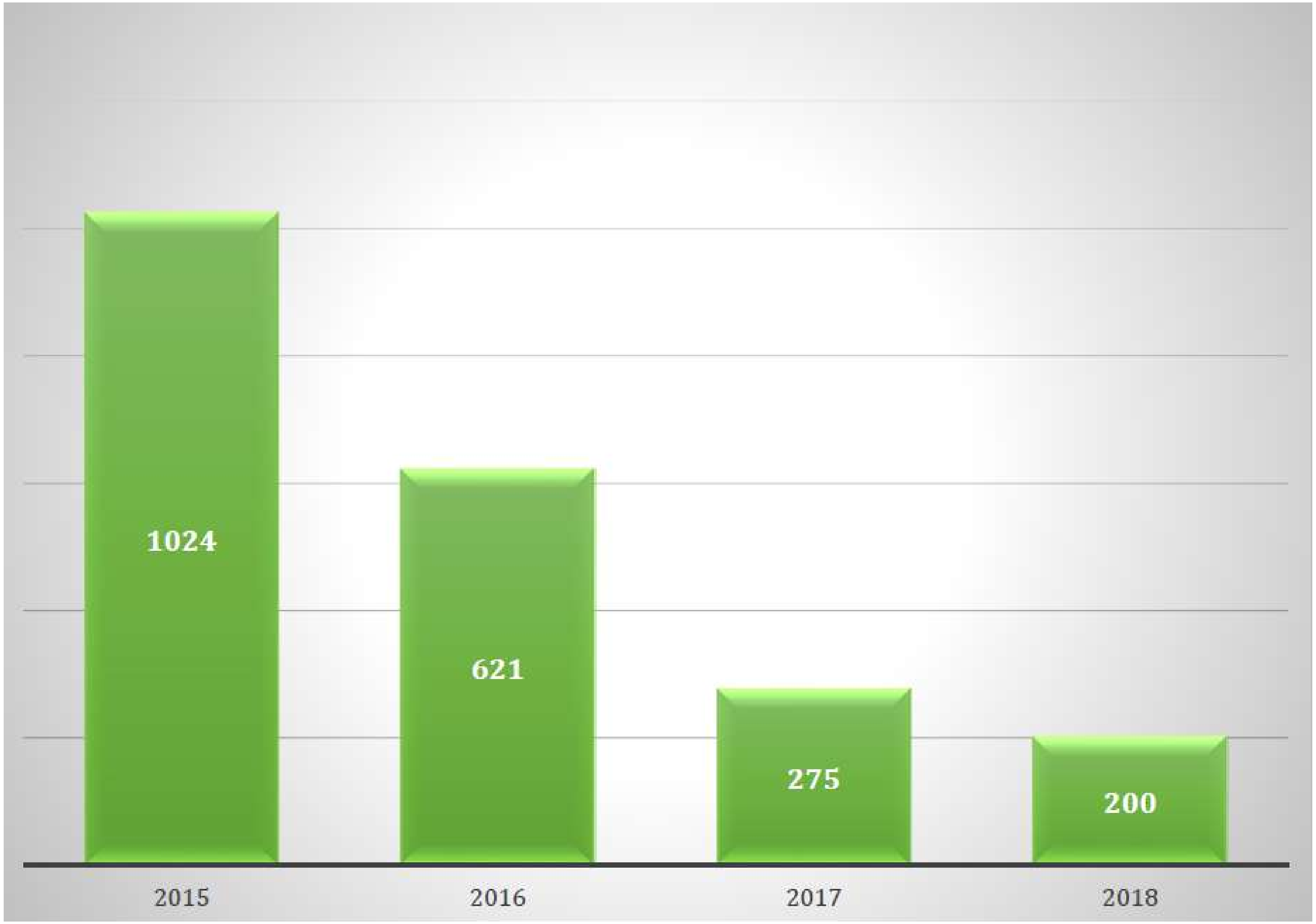
Energy 10 MeV/A



Teaching

- Workshops for students
- BSc, MSc, PhD theses (~ 10/year)
- Lectures at Faculties of Physics and Chemistry

Lectures



Awards funded by HIL

- HIL Prize (Inamura Prize), every even year
- Tomek Czosnyka Prize, every odd year

Thank you