



# Progress Report NUCLEAR REACTION DATA GROUP at ATOMKI

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# Outline

- ◆ The research program
- ◆ Experimental works and partner institutes
- ◆ Theoretical calculations and partner institutes
- ◆ Data compilations and evaluations
- ◆ Staff
- ◆ Publications in 2012-2014

# The research program

The last programs are connected to:

- ◆ Systematic experimental study of activation cross sections of proton and deuteron induced reactions for comparison with the results of modern theoretical codes to establish a more reliable experimental database and to prepare of a general use activation file up to 100 MeV protons and 50 MeV deuterons.
- ◆ Systematic investigation of nuclear data for production of radioisotopes candidate for use in diagnostic and radiotherapy, not covered by international projects.
- ◆ Investigations of nuclear data of new candidate monitor reactions.
- ◆ Development of experimental and data evaluation methods of nuclear data measurements and methods of applications

# Experimental works and partner institutes

## *Main application areas*

- ◆ Activation cross sections for **accelerator and target technology** and for radiation protection.
- ◆ Cross section data for **production of medical radioisotopes** for diagnostic investigations and for therapy.
- ◆ Activation cross sections for **Thin Layer Activation Technique (TLA)**.
- ◆ Preparation of a **general use CP activation data file**.
- ◆ Development and **upgrade the theoretical codes**

# Used accelerator facilities and collaborations

- ◆ Institute for Nuclear Research, Hungarian Academy of Sciences (**ATOMKI, Debrecen**, Hungary)
- ◆ Cyclotron Laboratory of the Vrije Universiteit Brussel (**VUB, Brussels**, Belgium)
- ◆ Cyclotron Radioisotope Centre of the Tohoku University (**CYRIC, Sendai**, Japan)
- ◆ Division of Advanced Technology for Medical Imaging of the National Institute of Radiological Sciences (**NIRS, Chiba**, Japan)
- ◆ Radionuclide Production Laboratory of the **iThemba Laboratory** for Accelerator Based Sciences (Somerset West, South Africa).
- ◆ Centre de Ressources du Cyclotron, UCL, (**CRC, Louvain-la-Neuve**, Belgium)

## Co-workers from other institutes

- ◆ Institute of Nuclear Chemistry (FZ Jülich, Germany)
- ◆ Physics Department (Cyclotron Facility), (Nuclear Research Centre, Atomic Energy Authority, AEA NRC, Inshas, Egypt)
- ◆ Department of Physics, (Government College University Lahore, Pakistan)

# Theoretical calculations and partner institutes

- ◆ Theoretical calculation of the measured data was done mostly in collaboration with scientist from *Institute of Theoretical Physics, IPPE, Obninsk, Russia (ALICE-IPPE, TALYS, EMPIRE)*
- ◆ Own calculations (*EMPIRE*)
- ◆ Theoretical results from **TENDL-2013** library (*TALYS, Nuclear Research and Consultancy Group (NRG) Petten, The Netherlands*)

# Data compilations and evaluations

## EXFOR

- ◆ Publications on charged particle induced nuclear reactions with **experimental data reported from Debrecen, Brussels and Jülich** were compiled in EXFOR format in collaboration with IAEA NDS.
- ◆ In the **last two years more than 40 paper** containing new experimental cross section data were published from the three institutes.



# Data compilations and evaluations

## *CRP and TC participations*

- ◆ Accelerator-based Production of Molybdenum/Techneium-99m (2012-2015)
- ◆ Development of a **reference database** for particle-induced gamma-ray emission (**PIGE**) (2011-2015)-(ATOMKI- Laboratory of Ion Beam Applications)
- Nuclear Data for **Charged-particle Monitor Reactions and Medical Isotope Production** (2012–2015 )

# Staff

- ◆ The staffs connected to the experimental nuclear reaction data measurement consist of five **physicists and two chemists**.
- ◆ Out of them two (**F. Tárkányi, S. Takács**) physicists are working in part time on data **compilation and evaluation**.

# Publications and conference talks in 2012-2014

- ◆ **Papers** published in international journals in which our group was involved containing experimental cross section data measured on different target materials bombarded by proton, deuteron, helium-3 and/or alpha particles **are around 46**.
- ◆ Papers (submitted, accepted, a head of print) are around **12**.
- ◆ **15 presentations** at international conferences

# Thank you for your attention!

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