

Progress Report
NUCLEAR REACTION DATA GROUP at ATOMKI
(2012-2014)
(NRDC Meeting, Smolenice, 2014)

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Introduction

The research program of the Atomki Nuclear Reaction Data Group did not change since last NRDC Meeting: measurement, compilation, evaluation and application of low and medium energy charged particle induced nuclear reaction data in international collaborations (see below). The experiments, data compilation and data evaluation are mainly connected to running international projects and to internal initiatives. 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 theoretical comparisons

We have continued the systematic investigation of excitation functions of reactions for the above mentioned applications. The experiments are done in Debrecen and at cyclotrons of foreign laboratories in the frame of well established long term collaboration, in :

- Institute of Nuclear Chemistry (FZ Jülich, Germany)
- 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 (Chiba, Japan)
- Radionuclide Production Laboratory of the iThemba Laboratory for Accelerator Based Sciences (Somerset West, South Africa).
- Centre de Ressources du Cyclotron, UCL, (Louvain-la-Neuve, Belgium)

In the experiments are also involved co-workers from institutes:

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

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 codes). We also use our own calculations using the EMPIRE code

Comparison is made in all cases with results from TENDL-2012 and 2013 libraries (TALYS, Nuclear Research and Consultancy Group (NRG) Petten, The Netherlands))

Data compilations and evaluations

EXFOR compilations

Our responsibility to compile experimental data of charged particle induced nuclear reactions reported from Debrecen, Brussels and Jülich were compiled in EXFOR format. In the last two years about 40 paper containing new experimental cross section data were compiled in EXFOR.

List of papers of missing EXFOR compilations were partly collected during data compilation for Medical Radioisotope CRP and during preparation of our new experimental data.

In a few cases errors were discovered in the already compiled EXFOR files which were corrected.

CRP and TC participations

- Accelerator-based Production of Molybdenum/Technetium-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 staff connected to the experimental nuclear reaction data measurement practically did not changed, it consists 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. Large set of experimental data are collected. Unfortunately no additional manpower is available for evaluation of the row experimental data. Data of some experiments are evaluated only 3-5 years after the experiment.

Publications in 2012-2014

Papers published in 2012-2014 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 45. The relevant papers are compiled in EXFOR database

Adam-Rebeles R., Van den Winkel P., Hermanne A., Tárkányi F., Takács S.:
Experimental excitation functions of deuteron induced reactions on natural thallium up to 50 MeV.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 288 (2012)1:94-101

Al-Abyad M., Abdel-Hamid A. S., Tárkányi F., Ditrói F., Takács S. , Seddik U. , Bashter I. I.:

Cross-section measurements and nuclear model calculation for proton induced nuclear reaction on zirconium.

Applied Radiation and Isotopes 70 (2012)257-262

Ditrói F., Tárkányi F. 1, Takács S., Dóczy R., Hermanne A., Ignatyuk A. V.:

Study of excitation function of deuteron induced reactions on ^{nat}Kr up to 20 MeV.

Applied Radiation and Isotopes 70 (2012)574-582.

Ditrói F., Takács S. , Tárkányi F. , Corniani E. , Smith R. W. , Jech M., Wopelka T.:

Sub-micron wear measurement using activities under the free handling limit.

Journal of Radioanalytical and Nuclear Chemistry 292 (2012)1147-1152.

Ditrói F., Tárkányi F., Takács S., Hermanne A., Ignatyuk A. V., Baba M.:

Activation cross-sections of deuteron induced reactions on natural palladium.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 270 (2012)61-74.

Ditrói F., Hermanne A., Tárkányi F., Takács S., Ignatyuk A. V.:

Investigation of the alpha-particle induced nuclear reactions on natural molybdenum.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 285 (2012)125-141.

Ditrói F., Tárkányi F., Takács S.:

Wear measurement using radioactive tracer technique based on proton, deuteron and alpha-particle induced nuclear reactions on molybdenum.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 290 (2012)30-38.

Hermanne A., Takács S., Tárkányi F., Adam-Rebeles R., Ignatyuk A.:

Excitation function for ⁷Be production in carbon by deuteron irradiations up to 50 MeV.

Applied Radiation and Isotopes 70 (2012)6:911-916.

Hermanne A., Takács S., Tárkányi F., Adam-Rebeles R., Ignatyuk A.:

Excitation functions for 7Be , $^{22,24}\text{Na}$ production in Mg and Al by deuteron irradiations up to 50 MeV.

Applied Radiation and Isotopes 70 (2012)1:2763-2772.

Hermanne A., Adam-Rebeles R., Tárkányi F., Takács S., Takács M. P., Csikai Gy., Ignatyuk A. :

Cross sections of deuteron induced reactions on 45Sc up to 50 MeV: Experiments and comparison with theoretical codes.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 270 (2012)1:106-115.

Hermanne A. , Tárkányi F., Takács S. , Adam-Rebeles R. , Ignatyuk A.:

Activation cross sections for deuteron induced reactions on Si up to 50 MeV.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 285 (2012)1:43-48

Takács S., Takács M. P., Hermanne A., Tárkányi F., Adam-Rebeles R.:

Cross sections of deuteron-induced reactions on ^{nat}Sb up to 50 MeV.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 278 (2012)1:93-105

Tárkányi F., Hermanne A., Takács S., Ditrói F., Spahn I., Ignatyuk A. V.:

Activation cross-sections of proton induced nuclear reactions on thulium in the 20-45 MeV energy range.

Applied Radiation and Isotopes 70 (2012)309-314..

Tárkányi F., Ditrói F., Takács S., Hermanne A., Ignatyuk A. V.:

Excitation functions of deuteron induced reactions on ^{nat}Xe : New data upto 20 MeV.

Applied Radiation and Isotopes 70 (2012)10:2344-2354.

Tárkányi F. , Ditrói F., Takács S., Király B., Hermanne A., Sonck M., Baba M., Ignatyuk A. V.:

Investigation of activation cross-sections of deuteron induced nuclear reactions on natural Mo up to 50 MeV.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 274 (2012)1:1-25.

Tárkányi F., Ditrói F., Hermanne A., Takács S., Ignatyuk A. V.:

Investigation of activation cross-sections of proton induced nuclear reactions on ^{nat}Mo up to 40 MeV: New data and evaluation.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 280 (2012)45-73.

Takács S., Tárkányi F., Ditrói F.:

Nuclear data for accelerator production of $^{99}\text{Mo}/^{99m}\text{Tc}$.

1st Research Co-ordination Meeting on Accelerator-based Alternatives to Non-HEU production of $\text{Mo-99}/\text{Tc}$. Vancouver, Canada, 16-20 April, 2012. Vienna, IAEA 0 (2012)51-64.

Adam-Rebeles R., Hermanne A., Van den Winkel P., De Vis L., Waegeneer R., Tárkányi F., Takács S., Takács M. P.:
⁶⁸Ge/⁶⁸Ga production revisited: Excitation curves, target preparation and chemical separation - purification.
Radiochimica Acta 101 (2013)8:481-489

Al-Abyad M., Tárkányi F., Ditrói F., Takács S.:
Excitation function of ³He induced nuclear reactions on ^{nat}Pt up to 26 MeV.
Applied Radiation and Isotopes 72 (2013)82-82.

Amjed N., Tárkányi F., Ditrói F., Takács S., Yuki H.:
Activation cross-sections of deuteron induced reaction of natural Ni up to 40 MeV.
Applied Radiation and Isotopes 82 (2013)1:87-99.

Ditrói F., Tárkányi F., Takács S., Hermanne A., Yamazaki H., Baba M., Mohammadi A., Ignatyuk A. V.:
Investigation of activation cross-section data of proton induced nuclear reactions on rhenium.
Applied Radiation and Isotopes 77 (2013)103-109

Ditrói F., Tárkányi F., Takács S., Hermanne A., Yamazaki H., Baba M., Mohammadi A.:
Activation cross-sections of longer lived products of proton induced nuclear reactions on cobalt up to 70 MeV.
Journal of Radioanalytical and Nuclear Chemistry 298 (2013)2:853-865

Ditrói F., Tárkányi F., Takács S., Hermanne A., Yamazaki H., Baba M., Mohammadi A., Ignatyuk A. V.:
Activation cross-sections of deuteron induced nuclear reactions on rhenium up to 40 MeV.
Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 296 (2013)92-101

Ditrói F., Tárkányi F., Takács S., Hermanne A., Yamazaki H., Baba M., Mohammadi A.:
Activation cross-sections of longer lived products of proton induced nuclear reactions on manganese up to 70 MeV.
Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 308 (2013)34-39

Hermanne A., Adam-Rebeles R., Tárkányi F., Takács S., Takács M. P., Ignatyuk A., Uddin M. S. :
Excitation functions of deuteron induced reactions on ^{nat}Os up to 50 MeV: Experiments and comparison with theoretical codes.
Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 297 (2013)1:75-85

Hermanne A., Takács S., Adam-Rebeles R., Tárkányi F., Takács M. P.:
New measurements and evaluation of database for deuteron induced reaction on Ni up to 50 MeV.
Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 299 (2013)1:8-23

Hermanne A., Adam-Rebeles R., Tárkányi F., Takács S., Csikai Gy., Takács M. P., Ignatyuk A.:

Deuteron induced reactions on Ho and La: Experimental excitation functions and comparison with code results.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 311 (2013)102-111

Takács S., Takács M. P., Hermanne A., Tárkányi F., Adam-Rebeles R.:

Cross sections of proton induced reactions on ^{nat}Sb.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 297 (2013)1:44-57

Takács S., Tárkányi F., Hermanne A., Adam-Rebeles R., Takács M. P.:

Excitation functions for the formation of longer lived isotopes by deuteron irradiation of Europium.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 310 (2013)54-66

Tárkányi F., Ditrói F., Takács S., Hermanne A., Ignatyuk A. V.:

Activation cross-sections of longer-lived products of proton induced nuclear reactions on dysprosium up to 36 MeV.

Annals of Nuclear Energy 62 (2013)375-381.

Tárkányi F., Ditrói F., Hermanne A., Takács S., Adam-Rebeles R., Walravens N., Cichelli O., Ignatyuk A. V.:

Investigation of activation cross-sections of proton induced nuclear reactions on ^{nat}Tl up to 42 MeV: Review, new data and evaluation.

Applied Radiation and Isotopes 74 (2013)1:109-122.

Tárkányi F., Ditrói F., Hermanne A., Takács S., Ignatyuk A. V.:

Investigation of production routes for the ¹⁶¹Ho Auger-electron emitting radiolanthanide, a candidate for therapy.

Journal of Radioanalytical and Nuclear Chemistry 298 (2013)277-286.

Tárkányi F., Hermanne A., Takács S., Ditrói F., Csikai Gy., Ignatyuk A. V.:

Cross-section measurement of some deuteron induced reactions on ¹⁶⁰Gd for possible production of the therapeutic radionuclide ¹⁶¹Tb.

Journal of Radioanalytical and Nuclear Chemistry 298 (2013)2:1385-1392

Tárkányi F., Ditrói F., Takács S., Hermanne A., Yamazaki H., Baba M., Mohammadi A., Ignatyuk A. V.:

Activation cross-sections of longer lived products of deuteron induced nuclear reactions on ytterbium up to 40 MeV.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 304 (2013)36(48)

Tárkányi F., Takács S., Ditrói F., Csikai Gy., Hermanne A., Ignatyuk A. V.:

Activation cross-section measurement of deuteron induced reactions on cerium for biomedical applications and for development of reaction theory.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 316 (2013)22-32

Tárkányi F., Takács S., Ditrói F., Hermanne A., Ignatyuk A. V.:

Activation cross-sections of longer-lived radioisotopes of deuteron induced nuclear reactions on terbium up to 50 MeV.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 316 (2013)183-191

Ali B. M., Al-Abyad M., Seddik U., El-Kameesy S., Ditrói F., Takács S., Tárkányi F.:

Experimental investigation and theoretical calculation of ^3He -particle induced nuclear reactions on cadmium up to 27 MeV.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 321 (2014)30-40./ 1.2662012;N

Tárkányi F., Ditrói F., Takács S., Csikai Gy., Hermanne A., Ignatyuk A. V.:

Activation cross-sections of long lived products of deuteron induced nuclear reactions on dysprosium up to 50 MeV.

Applied Radiation and Isotopes 83 (2014)18-24.

Tárkányi F., Takács S., Ditrói F., Csikai Gy., Hermanne A., Ignatyuk A. V.:

Activation cross-sections of deuteron induced reactions on ^{nat}Gd up to 50 MeV.

Applied Radiation and Isotopes 83 (2014)25-35

Tárkányi F., Takács S., Ditrói F., Hermanne A., Yamazaki H., Baba M., Mohammadi A., Ignatyuk A. V.:

Activation cross-sections of deuteron induced nuclear reactions on neodymium up to 50 MeV.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 325 (2014)15-26.

Forrest R. A., Kalbach Walker C., Avrigeanu M., Avrigeanu A., Ignatyuk A. V., Tárkányi F., Trkov A., Kopecky J., Fischer U.:

FENDL-3 Library. Final Report of the Coordinated Research Project on Nuclear Data Libraries for Advanced Systems: Fusion Devices.

Vienna, IAEA Nuclear Data Section (INDC(NDS)-0645)) 0 (2013)1-133

Szűcs Z., Takács S., Maiti Moumita, Lahiri S.:

Production of ^{163}Ho radioisotope via indirect nuclear reaction by proton and deuteron: Comparison of theoretical calculation and experimental data.

International Conference on Application of Radiotracers and Energetic Beams in Sciences. ARCEBS 14. Kolkata, India, 12-18 Jan., 2014. Proceedings. Eds.: Lahiri, S. et al. Kolkata, Saha Institute of Nuclear Physics 4 (2014)43-44

Szűcs Z., Takács S., András D., Kovács B., Máthé D.:

^{203}Pb with high specific activity for nuclear medicine.

International Conference on Application of Radiotracers and Energetic Beams in Sciences. ARCEBS 14. Kolkata, India, 12-18 Jan., 2014. Proceedings. Eds.: Lahiri, S. et al. Kolkata, Saha Institute of Nuclear Physics 4 (2014)183-184

Szelecsényi F., Kovács Z., Nagatsu K., Fukumura K., Suzuki K., Mukai K.:

Investigation of direct production of ^{68}Ga with low energy multiparticle accelerator.
Radiochimica Acta 100 (2012)1:5-11

Vermeulen Ch., Steyn G. F., Szelecsényi F., Kovács Z., Suzuki K., Nagatsu K., Fukumura T., Hohn A., van der Walt T. N.:

Cross sections of proton-induced reactions on ^{nat}Gd with special emphasis on the production possibilities of ^{152}Tb and ^{155}Tb .

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 275 (2012)1:24-32

Steyn G. F., Vermeulen Ch., Szelecsényi F., Kovács Z., Hohn A., van der Meulen N. P. Schibli R., van der Walt T. N.:

Cross sections of proton-induced reactions on ^{152}Gd , ^{155}Gd and ^{159}Tb with emphasis on the production of selected Tb radionuclides.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms 319 (2014)128-140

Submitted papers

Hermanne A., Tarkanyi F, Takacs S., Ditroi F, Amjed N.

Excitation functions for production of ^{46}Sc by deuteron and proton beams in ^{nat}Ti : a basis for additional monitor reactions.

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms (2014) (submitted)

F. Tárkányi, A. Hermanne, S. Takács, F. Ditrói, J. Csikai, A.V. Ignatyuk

Cross-sections of deuteron induced reactions on ^{nat}Sm for production of the therapeutic radionuclide ^{145}Sm and ^{153}Sm .

Applied Radiation and Isotopes (2014) (submitted)

N. Amjed N, F. Tárkányi, A. Hermanne, F. Ditrói, S. Takács, M. Hussain

Activation cross-sections of proton induced reaction of natural Ni up to 65 MeV

Applied Radiation and Isotopes (2014) (submitted)

F. Tárkányi, S. Takács, F. Ditrói, A. Hermanne, A. V. Ignatyuk, M. S. Uddin

Activation cross sections of α -particle induced nuclear reactions on hafnium and deuteron induced nuclear reaction on tantalum: production of a $^{178}\text{W}/^{178m}\text{Ta}$ generator

Applied Radiation and Isotopes (2014) (submitted)

F. Tárkányi, F. Ditrói, S. Takács, A. Hermanne, A. V. Ignatyuk

New data on activation cross section data for deuteron induced reactions on ytterbium up to 50 MeV

Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms (2014) (submitted)

F. Ditrói, F. Tárkányi, S. Takács, A. Hermanne

Proton-induced cross-sections of nuclear reactions on lead up to 37 MeV

Applied Radiation and Isotopes (2014)
In Press, Accepted Manuscript, Available online 13 April 2014

F. Ditrói, F. Tárkányi, S. Takács, A. Hermanne, A. V. Ignatyuk
Excitation functions of $^{nat}Pb(d,x)^{206,205,204,203,202}Bi$, $^{203cum,202m,201cum}Pb$ and $^{202cum,201cum}Tl$ reactions up to 50 MeV
Journal of Radioanalytical and Nuclear Chemistry
In Press, Accepted Manuscript , 10.1007/s10967-014-3056-7

F. Tárkányi, A. Hermanne, S. Takács, F. Ditrói, J. Csikai, A.V. Ignatyuk
Activation cross-sections of deuteron induced reactions on ^{nat}Sm up to 50 MeV
Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms (2014)
In Press, Accepted Manuscript

A. Hermanne, F. Tarkanyi, S. Takacs
Activation cross sections for production of 7Be by proton and deuteron induced reactions on 9Be ; protons up to 65 MeV and deuterons up to 50 MeV.
Applied Radiation and Isotopes (2014)
In Press, Accepted Manuscript

A. Hermanne, R. Adam Rebeles, P. Van den Winkel, F. Tarkanyi, S. Takacs.
Production of ^{111}In and ^{114m}In by proton induced reactions: an update on excitation functions, chemical separation – purification and recovery of target material.
Radiochimica Acta (submitted)

A. Hermanne, R. Adam Rebeles, P. Van den Winkel, F. Tarkanyi, S. Takacs
Activation of ^{112}Cd by deuteron induced reactions up to 50 MeV: an alternative for ^{111}In production?
Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms (2014) (submitted)

Szelecsényi, Ferenc / Kovács, Zoltán / Nagatsu, Kotaro / Zhang, Ming-Rong / Suzuki, Kazutosi
Excitation function of (p,α) nuclear reaction on enriched ^{67}Zn : possibility of production of ^{64}Cu at low energy cyclotron
Radiochimica Acta
Published Online: 04/04/2014

Conference talks in 2012-2014

Ditrói F., Takács S. , Tárkányi F.:
Thin Layer Activation (TLA) analysis of different materials for wear, corrosion and erosion measurement.
22nd International Conference on the Application of Accelerators in Research and Industry. CAARI 2012. Dallas Fort Worth, USA, 5-10 Aug., 2012 0 (2012)

Ditrói F., Tárkányi F. :

Applied research at the Cyclotron Application Department of MTA Atomki.
CYCLEUR Cyclotron Research Workshop, JRC Enlargement and Integration Programme.
Ispra, Italy, 29-30 Nov., 2012 0 (2012)

Takács S., Ditrói F., Tárkányi F.:
Impact of subsequent irradiation on the composition of recycled highly enriched ^{100}Mo target material (Abstr.: p. 42).
14th International Workshop on Targetry and Target Chemistry. Riviera Maya, Quintana Roo, Mexico, 26-29 Aug., 2012 0 (2012)

Tárkányi F.:
Progress report to IAEA CRP improvements in charged-particle monitor reactions and nuclear data for medical isotope production.
1st Meeting on Coordinated Research Project on Charged Particle Cross Section Data for Beam Monitoring and for Production of Therapeutic Radionuclides. Vienna, Austria, 3-5 Dec., 2012 0 (2012)

Tárkányi F.:
Progress report on nuclear data research in Hungary (for the period 1 January, 2011 - 30 April, 2012).
29th International Nuclear Data Committee Meeting. Vienna, Austria, 8-11 May, 2012 0 (2012)

Adam-Rebeles R., Tárkányi F., Takács S., Takács M. P., et al.:
 ^{68}Ge - ^{68}Ga production: Excitation functions, target preparation and PC-controlled radiochemistry system.
11th International Topical Meeting on Nuclear Applications of Accelerators. AccApp 2013. Bruges, Belgium, 5-8 Aug., 2013 0 (2013)

Cantone M., Tárkányi F., et al.:
Radionuclides for nuclear medicine: A nuclear physicists view (e-abstracts).
26th Annual Congress of the European Association of Nuclear Medicine. EANM. Lyon, France, 19-21 Oct., 2013 0 (2013)

Ditrói F., Tárkányi F., Takács S., et al.:
Activation cross-sections of proton induced nuclear reactions on lead for nuclear applications.
11th European Conference on Accelerators in Applied Research and Technology. ECAART 11. Namur, Belgium, 8-13 Sept., 2013 0 (2013)

Hermanne A., Tárkányi F., Takács S., Csikai Gy., Takács M. P., et al.:
Deuteron induced reactions on rare earths: Experimental excitation functions and comparison with code results (Abstr.: pp. 231-232).
International Conference on Nuclear Data for Science and Technology. ND 2013. New York, USA, 4-8 March, 2013 0 (2013)

Hermanne A., Tárkányi F., Takács S., Ditrói F., Amjed N. :
Monitoring of proton beams up to 40 MeV: An update of excitation functions for established and proposed reactions on Ni, Cu and Ti.

The 2013 International Conference on Applications of Nuclear Techniques. Crete, Greece, 23-29 June, 2013 0 (2013)

Tárkányi F. , Takács S., Ditrói F., et al.:

Production of the medical radioisotope ^{149}Pm by proton and deuteron induced reactions on neodymium.

11th European Conference on Accelerators in Applied Research and Technology. ECAART 11. Namur, Belgium, 8-13 Sept., 2013 0 (2013)

Tárkányi F., Takács S. , Ditrói F., et al.:

Nuclear reaction data for investigation of accelerator based production routes of radio-lanthanides for therapy.

International Nuclear Physics Conference. INPC 2013. Firenze, Italy, 2-7 June, 2013 0 (2013)

Tárkányi F., Takács S., Ditrói F., Király B., Csikai Gy., Takács M. P., et al. :

Systematic study of activation cross sections of deuteron induced cross sections for applications and for reaction model developments.

International Nuclear Physics Conference. INPC 2013. Firenze, Italy, 2-7 June, 2013 0 (2013)

Tárkányi F.:

Experimental techniques (Nuclear reaction data, estimation of uncertainties).

Workshop on Nuclear Data for Science and Technology: Medical Applications. Miramare-Trieste, Italy, 30 Sept. - 4 Oct., 2013 (2013)

Tárkányi F.:

Compilation and standardization of data.

Workshop on Nuclear Data for Science and Technology: Medical Applications. Miramare-Trieste, Italy, 30 Sept. - 4 Oct., 2013 (2013)
