AGH University of Science and Technology

Faculty of Physics and Applied Computer Science

Annual Report 2016

Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakówie

Wydział Fizyki i Informatyki Stosowanej

Raport Roczny 2016

Faculty of Physics and Applied Computer Science
Wydział Fizyki i Informatyki Stosowanej AGH

DEAN
prof. dr hab. Janusz Wolny

DEPUTY DEAN FOR SCIENCE AND COOPERATION
prof. dr hab. inż. Bartłomiej Szafran

DEPUTY DEAN FOR EDUCATION
dr hab. Łukasz Gondek, dr hab. inż. Krzysztof Malarz

DEPUTY DEAN FOR STUDENT AFFAIRS
dr inż. Paweł Armatys

ADMINISTRATIVE DIRECTOR
dr inż. Janusz Chmist

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Preface

The Faculty of Physics and Applied Computer Science (FPACS) is one of the fifteen Faculties of the AGH University of Science and Technology in Cracow. The origins of the Faculty date back to foundation of the Academy of Mining in 1919 including the Chair of Physics. Over the following decades the Chair has undergone several organizational transformations until in 1991 the AGH Senate has decided to form the Faculty of Physics and Nuclear Techniques. In 2004 the name was changed to Faculty of Physics and Applied Computer Science, to follow the changes in the fields of scientific and educational activity.

Scientific activity of the Faculty comprises both basic and applied research in solid state physics, nuclear and elementary particles physics, medical physics, physics of the environment and computer science.

The Faculty is the Leader of the Marian Smoluchowski Kraków Scientific Consortium that has been awarded the status of the Leading National Research Centre (KNOW) for 2012-2017.

The Faculty since 2013 has the highest (A+) category of research units in Poland as one of 37 institutes out of 960 that have been evaluated by the Research Units Evaluation Committee. In 2015 the Faculty received an accreditation from the Central Commission (CK) for scientific degrees and titles to grant PhD degrees in biophysics.

There are six departments within the Faculty:

1. Department of Applied Informatics and Computational Physics (Katedra Informatyki Stosowanej i Fizyki Komputerowej)
2. Department of Applied Nuclear Physics (Katedra Zastosowań Fizyki Jądrowej)
3. Department of Medical Physics and Biophysics (Katedra Fizyki Medycznej i Biofizyki)
4. Department of Solid State Physics (Katedra Fizyki Ciała Stałego)
5. Department of Particle Interaction and Detection Techniques (Katedra Oddziaływań i Detekcji Cząstek)
6. Department of Condensed Matter Physics (Katedra Fizyki Materii Skondensowanej)

The faculty staff is composed of 175 employees: 120 teachers and researchers, including 29 holders of professor degree in physics, as well as 55 technical and administrative officers.

The Faculty leads B.Sc., M.Sc. and Ph.D. studies. The undergraduate studies consist of seven-semester bachelor programs in three distinct areas: technical physics, medical physics and applied computer science. They are followed by three-semester graduate programs, leading to the M.Sc. degree in the various specializations.

AREA: MEDICAL PHYSICS; SPECIALIZATIONS:

Dosimetry and Electronics in Medicine,

Imaging and Biometrics,

AREA: TECHNICAL PHYSICS

AREA: APPLIED COMPUTER SCIENCE; SPECIALIZATION:

Data Modeling and Analysis

Computer Graphics and Image Processing

Reconfigurable and Embedded Systems

Computer Methods in Science and Technology (in English)

The Faculty leads teaching in both general and specialized physics for students of all the Facul ties of the AGH-UST at both undergraduate and graduate levels. The teaching covers lectures, auditorial classes and laboratory work. Some of lectures are offered in English, in particular the entire PhD study course. Faculty organizes complementary courses for the 1st year students of the University in physics (parallel to complementary courses in mathematics, organized by the Faculty of Applied Mathematics). The aim of the courses is to fill possible gaps in the high-school education to increase the efficiency of the training for the candidates who undertook such studies.

The Faculty hosts four-year programs of Ph.D. Studies in Physics: in physics and biophysics.

The Faculty offers also a three semester Post-diploma (part-time) Study for Teachers. The stud- ies are intended for primary and secondary school teachers, who want to gain additional qualifications giving them right to teach: physics, mathematics, chemistry, computer science, natural sciences and technical education.

Physicists – Doctors Honoris Causa of AGH University of Science and Technology

PROF. MARIAN MIĘSOWICZ 1979

PROF. ANDRZEJ OLEŚ 1995

PROF. MICHAŁ HELLER 1996

PROF. ANDRZEJ Z. HRYNKIEWICZ 1999

PROF. MANUEL RICARDO IBARRA 2008

PROF. JURGEN M. HÖNIG 2010

Physicist – Honorary Consul of AGH University of Science and Technology

PROF. ROLF-DIETER HEUER (GENERAL DIRECTOR OF CERN) 2009

Physicist – AGH-UST Honorary Professor

PROF. JERZY NIEWODNICZAŃSKI 2009

Long-term visitors

17.11-20.12.2016: Rituparna Chaki – University of Calcutta

07.10-09.11.2016: Nabendu Chaki – University of Calcutta

01.10-30.11.2016: Wolfgang Lohmann – Brandenburg University of Technology

31.03-29.04.2016: László T. Kóczy – Budapest University of Technology and Economics

02.04-30.04.2016: Hans-Rainer Trebin – Universität Stuttgart 16

Awards in 2016 / Nagrody w 2016 r

dr hab. inż. Iwona Grabowska-Bołd

Prime Minister Award for the Habilitation Thesis

Nagroda Prezesa Rady Ministrów za rozprawę habilitacyjną

prof. dr hab. Piotr Bożek

Rubinowcz Scientific Award of the Polish Physical Society

Nagroda PTF im. Rubinowicza

mgr inż. Agnieszka Patulska

Winner of Diamenty AGH award for the best master thesis at AGH

I miejsce „Diamenty AGH"

supervisor opiekun dr hab. inż. Joanna Chwiej

mgr inż. Paweł Miry

distinction of the master thesis in the competition for the best thesis of the Polish Biomedical Engineering Society

wyróżnienie w konkursie na najlepszą pracę magisterską Polskiego Towarzystwa Inżynierii Biomedycznej

supervisor opiekun dr inż. Sebastian Wroński

inż. Michał Kud

Award of the Polish Nucleonic Society for diploma thesis

Nagroda Polskiego Towarzystwa Nukleonicznego za pracę dyplomową

supervisor opiekun dr inż. Joanna Dudała

mgr inż. Aleksandra Ejme

Award of the Polish Medical Physics Society for diploma thesis

Nagroda Polskiego Towarzystwa Fizyki Medycznej za pracę dyplomową

Departments, Groups and Leaders, Achievements in 2016
Katedry, Zespoły i ich kierownicy, Najważniejsze osiągnięcia w 2016 r.

Department of Solid State Physics
Katedra Fizyki Ciała Stałego

Head

prof. dr hab. Czesław Kapusta (till 1.11.2016) full profesor

dr hab. Wiesław Marek Woch (since 1.11.2016), assistant professor

Magnetic Bulk and Nanomaterials Group
Zespół Materiałów Magnetycznych Litych i Nanomateriałów

prof. dr hab. Kapusta Czesław, full professor

dr. hab. Przewoźnik Janusz, assistant professor

dr. inż. Rybicki Damian, assistant professor

dr. inż. Michalik Jan, assistant professor

dr inż. Gąska Karolina, research assistant

dr inż. Fiejdasz Sylwia, research assistant

mgr inż. Lemański Andrzej, teaching assistant

Magnetic, electrical and structural research group

Zespół badań magnetycznych, elektrycznych i strukturalnych

dr hab. Antoni Paja, associate professor

dr hab. Łukasz Gondek, assistant professor

dr Joanna Czub, assistant professor

dr inż. Janusz Niewolski, teaching assistant

Superconducting and Magnetic Materials Group
Zespół Materiałów Nadprzewodzących i Magnetycznych

prof. dr hab. inż. Tarnawski Zbigniew, professor

prof. dr hab. inż. Kąkol Zbigniew, full professor

prof. dr hab. inż. Kozłowski Andrzej, professor

dr hab. Woch Wiesław, assistant professor

dr inż. Chmist Janusz, assistant professor

dr inż. Tokarz Waldemar, assistant professor

dr inż. Tabiś Wojciech, assistant professor

dr Zalecki Ryszard, assistant professor

dr inż. Kowalik Marcin, research assistant

dr inż. Maciej Chrobak, research assistant

Surface Nanostructures Group
Zespół Nanostruktur Powierzchniowych

prof. dr hab. Józef Korecki, full professor

dr hab. Tomasz Ślęzak, assistant professor

dr Wojciech Karaś, assistant professor

dr Michał Ślęzak, assistant professor

dr Ewa Młyńczak, research assistant

dr Krzysztof Matlak, research assistant

dr Anna Kozioł-Rachwał, assistant professor

prof. dr hab. inż. Przybylski Marek, full professor

Supporting Staff

mgr Dziok Agnieszka

mgr Pilipowicz Aleksander

mgr inż. Musiał Wacław

mgr Rulewicz Karol

Bąkowski Mariusz

Profile

Scientific activity of the Department concentrates on the studies of structural, magnetic and electronic properties in the nano- and sub-nanometric thin films, metal-oxide nanostructures and multilayers for magnetic and catalytic applications, intermetallics and their hydrides, novel materials and systems for hydrogen storage and their in-situ investigation with neutron scattering, in superconductors, including the HTc ones, in magnetic oxides, including magnetite and the colossal - and low field magnetoresistive ones, in topological insulators, in nanoparticle magnetic materials for MRI contrast and magnetic hyperthermia, in molecular magnets as well as in disordered metallic materials.

Działalność naukowa Katedry koncentruje się na badaniach własności i zjawisk strukturalnych, magnetycznych i elektronowych w nano- i sub-nanometrowych cienkich warstwach, nanostrukturach metal-tlenek i wielowarstwach do zastosowań magnetycznych i katalitycznych, w związkach międzymetalicznych i ich wodorkach, w nowoczesnych materiałach i układach do magazynowania wodoru i badaniu ich właściwości metodą dyfrakcji neutronów in-situ, w nadprzewodnikach, w tym wysokotemperaturowych, w tlenkach magnetycznych, w tym wykazujących kolosalny i niskopolowy magnetoopór oraz w magnetycie, w izolatorach topologicznych, w materiałach nanocząstkowych na środki kontrastowe do MRI i do hipertermii magnetycznej, w magnetykach molekularnych oraz w nieuporządkowanych materiałach metalicznych.

The experimental facilities of the Department include:

1. MBE set-up for preparation and analysis of thin films and nanostructures, equipped with LEED, AES, MOKE and CEMS with UHV sample transfer possibility.
2. ARUPS-XPS spectrometer.
3. Scanning tunneling microscope, 30-300 K temperature range.
4. VSM, AC susceptometer, ESR spectrometer, set-up for magnetoresistance measurements with closed circle refrigerator and calorimeter for specific heat measurements in 2-300 K range.
5. X-ray diffractometers (2) with temperature controll within 2-450 Kand 300-1450 K range.
6. Physical Property Measurement System (Quantum Design model, closed circle liquifier) equipped with 9 Tesla magnet, 2-400 K (VSM: 2-1100 K) temperature range, options: DC susceptibility, magnetisation, torque magnetometry, AC susceptibility, resistance/magnetoresistance, thermal expansion & magnetostriction, thermal transport & thermoelectric properties, specific heat.

7. Mössbauer spectrometers (4), transmission & CEMS, for 6 isotopes, 4-1000 K temperature range.
8. NMR spectrometers for proton resonance (15 MHz) and for magnetic materials, 5-1000 MHz, closed circle refrigerator, 2-300 K.
9. Setaram PCT-PRO automatic sorption analyser (H, He, N, hydrocarbon-gases) operating in pressures up to 200 bar and temperatures from 77 K up to 650 K.
10. Fritsch Pulverisette 7 Premium line high-energy planetary mills with equipment for milling in reactive or inert atmosphere or in suspensions.

Achievements
Osiągnięcia

Magnetic Bulk- and Nanomaterials Group
Zespół Materiałów Magnetycznych Litych i Nanomateriałów

Phase diagram for high temperature superconductors was constructed, predicting record values for critical temperature and the method of its evaluation from Cu and O NMR measurements was given. The structure and magnetic properties were determined for $Ni_{50}Mn_{37.5}Sn_{12.5}$ martensite single crystal exhibiting shape memory and a huge magnetocaloric effect near room temperature.

Zbudowano diagram fazowy nadprzewodników wysokotemperaturowych przewidujący rekordowe temperatury krytyczne oraz podano sposób ich przewidywania z pomiarów NMR na Cu i O. Scharakteryzowano strukturę i właściwości i magnetyczne monokryształu martenzytu $Ni_{50}Mn_{37.5}Sn_{12.5}$ wykazującego pamięć kształtu i olbrzymi efekt magnetokaloryczny w pobliżu temperatury pokojowej

Magnetic, electrical and structural research group
Zespół badań magnetycznych, elektrycznych i strukturalnych

Proving that reported weak ferromagnetic behavior for quasicrystalline $Ti_{45}Zr_{38}Ni_{17}$ alloy is not an intrinsic property of the alloy, but originates from extremely small Ni-clusters at the grains' boundaries. Therefore, the alloy must be classified as the Pauli-paramagnet.

Wykazano, że kwazikrystaliczny stop $Ti_{45}Zr_{38}Ni_{17}$ nie wykazuje dalekozasięgowego uporządkowania magnetycznego, natomiast raportowane właściwości ferromagnetyczne wynikają jedynie z obecności nanoklasterów niklu wytrąconych na granicach ziaren. Badania jednoznacznie wskazują, że stop ten jest paramagnetykiem Pauliego.

Superconducting and Magnetic Materials Group
Zespół Materiałów Nadprzewodzących i Magnetycznych

The irreversibility fields were found for superconducting tapes and for $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_x$ critical exponents and character of fluctuations. In $YBa_2Cu_4O_8$ quantum oscillations were measured and superconducting state inhomogeneity was found in film of NbN present at $T > T_c$ and forming pseudo-gap. The electronic structure of materials with non-trivial surface properties assumed for application in quantum computers and electronics and (topological insulators) was investigated theoretically and experimentally. It was found that quantum oscilations are not responsible for high T_c. New composite material $GdBa_2Cu_3O_{7-\delta}$ - nanoparticles γ-Fe_2O_3 was synthesized and its critical currents were found.

Dla taśm BSCCO wyznaczono pola nieodwracalności, a dla $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_x$ wykładniki krytyczne i typy fluktuacji. W $YBa_2Cu_4O_8$ zbadano oscylacje kwantowe, a w warstwie NbN zaobserwowano niejednorodności we własnościach nadprzewodzących, obecne nawet w $T > T_c$ i tworzące obszar pseudoprzerwy. Zbadano, teoretycznie i eksperymentalnie, strukturę elektronową materiałów o nietrywialnych właściwościach powierzchni rozważanych do zastosowania w komputerach kwantowych i elektronice. Udowodniono [11], że fluktuacje kwantowe nie powodują wysokiej T_c. Zsyntetyzowano kompozyt $GdBa_2Cu_3O_{7-\delta}$ - nanocząstki γ-Fe_2O_3 oraz wyznaczono jego prądy krytyczne.

Surface Nanostructures Group
Zespół Nanostruktur Powierzchniowych

Interpretation of giant in-plane magnetic anisotropy in epitaxial bcc Co/Fe(110) bilayers

Interpretacja gigantycznej anizotropii magnetycznej w płaszczyźnie epitaksjalnych dwu-warstw Co/Fe(110)

Activity
Działalność organizacyjna

J. Czub

Member of the Małopolska Regional Committee of the Physics Competition

Członek Małopolskiego Okręgowego Komitetu Olimpiady Fizycznej

Ł. Gondek

Member of the Scientific Selection Panel of Helmholtz-Zentrum Berlin	Członek panelu naukowego Instytutu Helmholtza w Berlinie

A. Paja

Member of the General Control Committee of the Polish Physical Society	Członek Głównej Komisji Rewizyjnej Polskiego Towarzystwa Fizycznego
Member of the Control Committee of the Polish Hydrogen and Fuel Cell Association	Członek Komisji Rewizyjnej Polskiego Stowarzyszenia Wodoru i Ogniw Paliwowych

J. Korecki

Member of Scientific Council of Academic Centre for Materials and Nanotechnology AGH, Kraków	Członek Rady Naukowej Akademickiego Centrum Materiałów i Nanotechnologii AGH
Member of Scientific Council of Jerzy Haber Institute of Catalysis and Surface Chemistry, Polish Academy of Sciences, Kraków.	Członek Rady Naukowej Instytutu Katalizy i Fizykochemii Powierzchni i. Jerzego Habera PAN w Krakówie
Member of „Polish Synchrotron" Consortium Council.	Członek Rady Krajowego Konsorcjum "Polski synchrotron"
Member of the Scientific Advisory Committee of the National Synchrotron Radiation Centre „Solaris"	Członek Naukowego Komitetu Doradczego Narodowego Centrum Promieniowania Synchrotronowego „Solaris"

Member of Scientific Advisory Committees of the European Schools on Magnetism,	członek Scientific Advisory Committees of the European Schools on Magnetism,
Member of International Advisory Committee of the Centre for Advanced Materials and Technologies – PROMATECH, Kosice, Słowacja,	członek International Advisory Committee of the Centre for Advanced Materials and Technologies – PROMATECH, Kosice, Słowacja,
Member of Committee on Material Science of Polish Academy of Sciences,	członek Komitetu Nauki o Materiałach Polskiej Akademii Nauk,
Member of Scientific Board of Polish Synchrotron Consortium (SOLARIS, Kraków),	członek Rady Naukowej Konsorcjum Polski Synchrotron, Kraków,
Member of Commission for Strategy and Development of InnoTechKrak	członek Komisji ds. Strategii i Rozwoju Związku Uczelni AGH-UR-PK InnoTechKrak,
Member of Senate of AGH University of Science and Technology,	członek Senatu AGH,
Member of Scientific Council of Institute of Metallurgy and Material Engineering of Polish Academy of Sciences in Kraków,	członek Rady Naukowej Instytutu Metalurgii i Inżynierii Materiałowej Polskiej Akademii Nauk w Krakówie,
Publication Editor for 61st Annual Meeting on Magnetism and Magnetic Materials (2016), 31 October – 4 November 2016, New Orleans, USA,	wydawca publikacji na 61st Annual Meeting on Magnetism and Magnetic Materials, 31 października - 4 listopada 2016, New Orleans, USA,
Member of Scientific Committee of XII Konferencji Naukowej Technologia Elektronowa ELTE-2016, 11-14 September 2016, Wisła, Poland,	członek Komitetu Naukowego XII Konferencji Naukowej Technologia Elektronowa ELTE-2016, 11-14 września 2016, Wisła,
Member of Program Advisory Committee of 9th Workshop on Applications of Scanning Probe Microscopy – STM/AFM 2016", 30.11 - 4.12.2016, Zakopane, Poland	członek Doradczego Komitetu Programowego IX Seminarium „Badania prowadzone metodami skaningowej mikroskopii bliskich oddziaływań STM/AFM 2016", 30 listopada - 4 grudnia 2016, Zakopane

Department of Medical Physics and Biophysics

Katedra Fizyki Medycznej i Biofizyki

Head

prof. dr hab. inż. Marek Lankosz, (till 1.11.2016) full profesor

dr hab. Joanna Chwiej, (since 1.11.2016), assistant professor

BIOMEDICAL AND ENVIRONMENTAL RESEARCH GROUP

ZESPÓŁ BADAŃ BIOMEDYCZNYCH I ŚRODOWISKOWYCH

prof. dr hab. inż. Marek Lankosz, full professor

dr hab. inż. Zdzisław Stęgowski, assistant professor

dr hab. inż. Magdalena Szczerbowska-Boruchowska, assistant professor

dr hab. inż. Dariusz Węgrzynek, assistant professor

dr inż. Joanna Dudała, assistant professor

dr inż. Leszek Furman, assistant professor

dr inż. Lucyna Samek, assistant professor

dr inż. Aleksandra Wandzilak,teaching assistant

dr Beata Ostachowicz, teaching assistant

mgr inż. Mateusz Czyżycki, teaching assistant

dr inż. Paweł Wróbel, teaching assistant

dr inż Artur Surówkai, teaching assistant

mgr Antoni Ostrowski

MOLECULAR BIOPHYSICS AND BIOENERGETICS GROUP

ZESPÓŁ BIOFIZYKI MOLEKULARNEJ I BIOENERGETYKI

dr hab. Kvetoslava Burda, associate professor

dr Joanna Fiedor, assistant professor

dr Aleksandra Orzechowska, assistant professor

dr Reanata Szymańska, assistant professor

BIOMEDICAL IMAGING AND MODELLING GROUP

ZESPÓŁ OBRAZOWANIA I MODELOWANIA

dr hab. inż. Jakub Cieślak, assistant professor

dr hab. Zenon Matuszak, assistant professor

dr hab. inż. Joanna Chwiej, assistant professor

dr inż. Aleksandra Jung, assistant professor

dr inż. Katarzyna Matusiak, assistant professor

dr Krzysztof Turek, assistant professor

MÖSSBAUER SPECTROSCOPY GROUP

ZESPÓŁ SPEKTROSKOPII MÖSSBAUEROWSKIEJ

prof. dr hab. Stanisław Dubiel, full professor

Profile

The Department of Medical Physics and Biophysics consists of four research groups. The purpose of the research carried out at Biomedical and Environmental Research Group is identification and clarification of the role of biomodulators in the pathogenesis of cancerous and neurodegenerative disorders. Molecular Biophysics and Bioenergetics Group research is focused on: photosynthetic electron transport and oxygen evolution, organization and physical/chemical properties of native and model dye-protein-lipid systems, topography, elasticity and adhesion of normal and pathological cells as well as chemical properties of functionalized carbon nanotubes.

Katedra Fizyki Medycznej i Biofizyki składa się z czterech zespołów badawczych. Badania naukowe prowadzone w Zespole Badań Biomedycznych i Środowiskowych mają na celu identyfikację i wyjaśnienia roli biomodulatorów w patogenezie nowotworów i chorób neurodegeneracyjnych. Zespół Biofizyki Molekularnej i Bioenergetyki zajmuje się badaniem: fotosyntetycznego transportu elektronów i wydzielania tlenu; organizacji i własności fizyko-chemicznych natywnych i modelowych układów barwnikowo-białkowo-lipidowych; topografii, elastyczności i adhezji zdrowych i patologicznych komórek oraz chemicznych własności funkcjonalizowanych nanorurek węglowych.

The research activities of Biomedical Imaging and Modeling Group cover, among others, development of the imaging methods for medical diagnostics. Among them, it is necessary to indicate magnetic resonance imaging, optical tomography as well imaging methods using radioactive isotopes. Moreover, the Group develops research topics concerning the modelling of the physiological processes, termoluminescence dosimetry and uses advanced spectroscopic methods for investigation of the pathogenesis and progress of neurological diseases as well as nanomaterials toxicity. The research interest of Mössbauer Spectroscopy (MS) Group includes bio-farmaceutico-medical physics. The main object of the research conducted in the MS Laboratory concerns investigation of various physical properties of technologically important alloys and compounds. Additional interest includes use of the MS in the investigation of Fe-containing samples of organic or/and pharmaceutical origin or application (like ferritin, antianemic medicaments etc).

The research at the Biomedical and Environmental Research Group relates to the development and application of analytical methods based on X-ray and infrared spectroscopy. The main topics of interest are biomedical research, environmental science, and protection of cultural heritage. Of particular importance is the investigation of the role of elements and biomolecules in the biochemical mechanisms of the pathogenesis and progress of ovarian cancers and neuromuscular disorders. The elemental and molecular chemical micro imagings are performed with the use of the techniques based on synchrotron radiation,i.e. synchrotron radiation X-ray fluorescence (SRXRF), X-ray absorption near edge structure (XANES) spectroscopy and Fourier transform infrared micro spectroscopy (FTIR).

Projekty badawcze realizowane w Zespole Badań Biomedycznych i Środowiskowych dotyczą opracowania i zastosowania metod pomiarowych opartych na promieniowaniu X oraz spektroskopii w podczerwieni. Główne kierunki zainteresowań obejmują badania biomedyczne, środowiskowe jak również ochronę dziedzictwa kulturowego. Szczególnie ważne jest wyjaśnienie roli pierwiastków i biomolekuł w procesach biochemicznych wzrostu nowotworów jajników oraz chorobach nerwowo mięśniowych. Do obrazowania rozkładu pierwiastków i biomolekuł w tkankach na poziomie komórkowym stosowane są techniki oparte na promieniowaniu synchrotronowym tzn. synchrotronowa rentgenowska analiza fluorescencyjna (SRXRF), absorpcja promieniowania X w pobliżu progu absorpcji (XANES), oraz mikro-spektroskopia promieniowania podczerwonego z zastosowaniem transformacji Fouriera (FTIR). Ponadto, badano wpływ własności strukturalnych tkanki ośrodkowego układu nerwowego człowieka na ilościowe obrazy rozkładu pierwiastków z wykorzystaniem techniki synchrotronowej rentgenowskiej mikroanalizy fluorescencyjnej. Pracowano nad implementacją metod korekty efektów związanych ze zróżnicowaniem strukturalnym tkanki bazując zarówno na metodach wykorzystujących promieniowanie rentgenowskie rozproszone niekoherentnie, sygnał transmisyjny, jak również przesunięcie w fazie koherentnej monoenergetycznej wiązki promieniowania X. Wykorzystując technikę mikrospektroskopii w podczerwieni z transformacją Fouriera i zaawansowane metody przetwarzania obrazów, badano zmiany molekularne zachodzące w sąsiedztwie złogów β-amyloidu w korze czołowej i formacji hipokampa w zwierzęcym modelu wczesnego stadium choroby Alzheimera.

Moreover, the research aimed at investigating the impact of structural properties of thin brain tissue sections on quantitative elemental distributions recorded by the synchrotron X-ray fluorescence microprobe. The correction methods, based on the intensity of the incoherently scattered X-rays, transmission signal and phase shift of the fully coherent, monoenergetic X-ray beam, were developed to account for structural variability of thin tissue slices. Based on Fourier transform infrared spectroscopy imaging and advanced image processing tools, the extent of molecular burden in the close vicinity of amyloid-β fibrils in the animal model of early stage Alzheimer disease was scrutinized. Moreover, the influence of transcranial direct current stimulation (tDCS) on elemental composition of brain structures in obese rats were studied. Also, the research aimed at finding a biomolecular markers of adrenal gland diseases including cases of the adrenal gland cancer (adrenal cortical carcinoma). Methodology for the X-ray fluorescence microscopy and the confocal X-ray fluorescence microscopy for analysis of the biomedical samples and the cultural heritage objects was developed. The investigations in environmental science are connected with the influence of air pollution, especially particulate matter on urban and rural environments, the chemical content of PM1 and PM2.5 in particular. On the basis of measurement data, PCA (Principal Component Analysis) and PMF (Positive Matrix Factorization) models were applied for the identification and quantitative evaluation of emission sources in Kraków. The laboratory is equipped with state-of-art facilities including X-ray fluorescence and infrared confocal microscopes, multifunctional X-ray fluorescence spectrometer for localized and bulk elemental ultra trace analysis.

Działalność naukowa Zespołu Obrazowania i Modelowania obejmuje, między innymi, rozwój metod obrazowania dla potrzeb diagnostyki medycznej. Wśród nich wyróżnić należy obrazowanie magnetyczno-rezonansowe, tomografię optyczną, jak również obrazowanie z użyciem izotopów promieniotwórczych. W zespole rozwijana jest ponadto tematyka związana z modelowaniem procesów fizjologicznych, dozymetrią termoluminescencyjną oraz stosowane są zaawansowane metody spektroskopowe do badania patogenezy i przebiegu schorzeń układu nerwowego, jak również toksyczności nanomateriałów. Zainteresowania naukowe Zespołu Spektroskopii Moessbauerowskiej koncentrują się na fizyce ciała stałego oraz fizyce bio-farmakomedycznej. Główna tematyka naukowa dotyczy badania różnych własności fizycznych stopów i związków technologicznie ważnych. Ponadto zainteresowania naukowe obejmują wykorzystanie spektroskopii moessbauerowskiej w badaniach postaci i własności żelaza, znajdującego się w próbkach organicznych (np. ferrytyna), a także w farmaceutykach i innych materiałach o zastosowaniach medycznych.

Badano zmiany zachodzące w strukturach mózgu szczurów otyłych pod wpływem przezczaszkowej bezpośredniej stymulacji mózgu (tDCS). Kontynuowano badania ukierunkowane na znalezieniu biomolekularnych markerów procesów chorobotwórczych zachodzących w tkankach nadnerczy wzbogacone o nowy rodzaj tkanek pochodzących z raka nadnercza. Prowadzono badania w zakresie rozwoju metodologii badawczych dla technik takich jak rentgenowska mikroskopia fluorescencyjna oraz konfokalna rentgenowska mikroskopia fluorescencyjna dla próbek biomedycznych oraz obiektów dziedzictwa kulturowego. Tematyka naukowa w zakresie ochrony środowiska dotyczy badania wpływu za-

nieczyszczeń pyłowych powietrza na degradację środowiska miejskiego i wiejskiego. Na potrzeby tych badań pobierano i oznaczano skład chemiczny pyłów powietrza frakcji PM1 i PM2.5. Na bazie danych pomiarowych zastosowane zostały modele PCA (Principal Component Analysis) i PMF (Positive Matrix Factorization) do identyfikacji i ilościowej oceny emisji źródeł zanieczyszczeń powietrza w Krakówie. Laboratorium jest wyposażone w wysoko specjalistyczną unikatową aparaturę w tym mikroskopy konfokalne promieniowania X i promieniowania podczerwonego, wielozadaniowy rentgenowski spektrometr fluorescencyjny do mikro/makro analiz ultra śladowych stężeń pierwiastków.

MOLECULAR BIOPHYSICS AND BIOENERGETICS GROUP
ZESPÓŁ BIOFIZYKI MOLEKULARNEJ I BIOENERGETYKI

Our research is focused on:

- electron and energy transport in photosystems of type II;
- role of non-heme iron on the activity of the acceptor side of type II photosystems; influence of cytochrome b559 on the activity of photosystem II;
- mechanism of oxygen evolution in photosynthesis;
- influence of heavy metals and selected nanoparticles on photosynthetic activity in algae and higher plants, studies in vitro and in vivo;
- toxicity of the antifouling paints to algae
- antioxidant and non-antioxidant properties of vitamin E complex
- physiological response of plants under abiotic stress conditions
- structure, organization and physical/chemical properties of native and model dye-protein-lipid systems;

Badania zespołu dotyczą:

- transportu elektronów i energii w obrębie fotosystemów typu II;
- wpływu żelaza niehemowego na aktywność strony akceptorowej fotosystemów typu II;
- wpływu cytochromu b559 na aktywność fotosystemu II;
- mechanizmu wydzielania tlenu w procesie fotosyntezy;
- wpływu metali ciężkich, wybranych nanocząstek oraz powłok „antyfoulingowych" na aktywność fotosyntetyczną glonów i roślin wyższych, badania in vitro i in vivo;
- antyoksydacyjnych i nie-antyoksydacyjnych właściwości witaminy E wpływu stresu abiotycznego na rośliny
- struktury, organizacji i własności fizykochemicznych natywnych i modelowych układów barwnikowo-białkowo-lipidowych;
- funkcji strukturalnych i ochronnego działania karotenoidów w natywnych i modelowych kompleksach fotosyntetycznych;

- protective and structural functions of carotenoids in native and model photosynthetic complexes;
- qualitative analysis of elements and relationships between them within cells and phototrophic membranes of photosynthetic bacteria grown either anaerobically or aerobically;
- optimization of measurement conditions for detection of infrared radiation in photosynthetic systems;
- physical properties - topography, elasticity, adhesion forces - of normal and pathological cells and their organelles, and determination of the influence of selected stimuli on these properties in both cell types;
- mechanical properties of biopolymers and their influence on cell vital functions such as migration, proliferation and adhesion;
- influence of ionization radiation and metal ions on membrane stability of human erythrocytes;
- physical and chemical characterization of carbon nanotubes.
- Applied experimental methods: absorption and fluorescence spectroscopy, fluorescence with double modulation, thermoluminescence, fast polarography, atomic force microscopy (AFM), Mössbauer spectroscopy. TXRF vertical and horizontal electrophoresis systems

- ilościowej analizy składu pierwiastkowego i korelacji pomiędzy poszczególnymi elementami w obrębie komórek i błon fototroficznych bakterii fotosyntetycznych hodowanych w warunkach aerobowych i anaerobowych;
- optymalizacja warunków pomiarowych emisji promieniowania podczerwonego w układach fotosyntetycznych badania wpływu wybranych czynników na własności fizyczne – topografię, elastyczność i siły adhezji - niezmienionych i patologicznych komórek;
- analizy wpływu własności mechanicznych biopolimerów na funkcje życiowe komórek, m.in. migrację, proliferację i adhezję;
- wpływu promieniowania jonizującego i jonów metali na stabilność błon erytrocytów;
- charakterystyki fizycznych I chemicznych własności nanorurek węglowych.
- Stosowane metody badawcze: spektroskopia absorpcyjna i fluorescencyjna, fluorescencja o podwójnej modulacji, termoluminescencja, szybka polarografia, mikroskopia sił atomowych (AFM), spektroskopia mössbauerowska, aparat do elektroforezy pionowej i poziomej.

BIOMEDICAL IMAGING AND MODELLING GROUP
ZESPÓŁ OBRAZOWANIA I MODELOWANIA

The research activities of Biomedical Imaging and Modeling Group cover, as previously, the subjects of Magnetic Resonance Imaging based on Nuclear Magnetic Resonance, optical imaging, modeling of physiological processes, nuclear medicine imaging and dosimetry in diagnostics and therapy with application of radioactive elements, application of advanced spectroscopic methods in biomedical research (UV-VIS-IR, EPR, Mössbauer, FTIR and XRF spectroscopy) and some issues from solid state physics (High Entropy Alloys).

Działalność naukowa Zespołu Obrazowania i Modelowania obejmuje jak poprzednio tematykę obrazowania magnetyczno-rezonansowego opartego o zjawisko magnetycznego rezonansu jądrowego, obrazowania optycznego, modelowania procesów fizjologicznych, obrazowania oraz dozymetrii w diagnostyce i terapii z wykorzystaniem izotopów promieniotwórczych w medycynie nuklearnej, wykorzystanie zaawansowanych metod spektroskopowych (UV-VIS-IR, EPR, FTIR, XRF i spektroskopia Mössbauera) w badaniach biomedycznych oraz wybraną problematykę z zakresu fizyki ciała stałego (stopy wysokoentropowe).

MÖSSBAUER SPECTROSCOPY GROUP
ZESPÓŁ SPEKTROSKOPII MÖSSBAUEROWSKIEJ

Our research activities were focused on experimental investigations of (a) magnetic and dynamic properties of sigma-phase compounds in Fe-X (X=Cr, V, Mo) and (b) microscopic phenomena in Fe-Cr alloys related to their macroscopic properties. Concerning (a) studies were realized by means of various experimental techniques including Mössbauer Spectroscopy (MS), DC and AC magnetic susceptibility measurements. Regarding (b) MS in transmission and CEMS modes were used to study the phase decomposition kinetics, Cr solubility limit in Fe matrix, short-range ordering in Fe-ion irradiated α- and σ-phase Fe-Cr alloys.

Zadania realizowane w 2017 roku dotyczyły badań: (a) własności magnetycznych i dynamiki sieciowej międzymetalicznych związków σ-FeX (X=Cr, V, Mo) przy pomocy następujących technik eksperymentalnych: spektroskopii mössbauerowskiej (MS), oraz stało- i zmiennoprądowych podatności magnetycznych, (b) mikroskopowych zjawisk w stopach Fe-Cr odpowiedzialnych za własności makroskopowe tych stopów. Stosując spektroskopię mössbauerowską w wersji transmisyjnej i CEMS badano w przypadku (b) takie zjawiska jak: kinetykę rozpadu fazowego, granicę rozpuszczalności Cr w żelazie, uporządkowanie bliskiego zasięgu. Badaniu poddano także stopy napromieniowane jonami Fe.

Achievements
Osiągnięcia

BIOMEDICAL ENVIRONMENTAL RESEARCH GROUP
ZESPÓŁ OBRAZOWANIA I MODELOWANIA

- The discovery of the link between certain trace metals and their role in the growth of brain and ovarian cancers cells which could help to redefine the way for identification of tumors, allowing for earlier diagnosis and better therapy.
- Application of Positive Matrix Factorization (PMF) statistical method to source pollution identification and apportionment of PM2.5 fraction. Determination of seasonal variations of elemental concentrations as well as the sources of origin.
- Start-up and presentation of lectures and laboratories in English for ERASMUS and UNESCO students.
- The correction scheme that accounts for the mass thickness effect was created and its performance was shown for the quantitative elemental micro-imaging of brain tissue by the synchrotron X-ray microprobe, full-field synchrotron X-ray phase contrast imaging and scanning transmission X-ray microscopy.
- Molecular changes induced by dense-core A? deposits were identified in-situ in the early-stage animal model of Alzheimer disease.
- The influence of transcranial direct current stimulation (tDCS) on elemental composition of brain structures in obese rats were determined.

- Skuteczne zastosowanie metod statystycznych Positive Matrix Factorization (PMF) do oszacowania rodzaju źródeł oraz ich udziału we frakcji PM2.5 Określenie zmienności sezonowej zarówno stężeń pierwiastków jak i źródeł ich pochodzenia.
- Uruchomienie i przeprowadzenie wykładów i ćwiczeń laboratoryjnych w języku angielskim dla studentów ERASMUS i UNESCO.
- Opracowano i wykazano skuteczność metod korekty efektów masy powierzchniowej na potrzeby ilościowego obrazowania składu pierwiastkowego cienkich skrawków tkanki mózgu, wykorzystując technikę synchrotronowej rentgenowskiej mikroanalizy fluorescencyjnej, rentgenowskiego kontrastu fazowego jak również skaningowej rentgenowskiej mikroskopii transmisyjnej na potrzeby obrazowania własności strukturalnych tkanki ośrodkowego układu nerwowego.
- Określono zmiany biochemiczne zachodzące wokół złogów β-amyloidu w zwierzęcym modelu wczesnego stadium choroby Alzheimera.
- Określono zmiany składu pierwiastkowego w strukturach mózgu otyłych szczurów pod wpływem przezczaszkowej bezpośredniej stymulacji mózgu (tDCS).

- Application of the total reflection X-ray fluorescence method for analysis of the medical and environmental samples.

- The new spectrometer Nanohunter II was installed. The sample preparation process was tested and optimized. Elemental analysis of the fat , serum and cancer was performed.

- A new algorithm for correction of the inter-layer absorption effects in X-ray fluorescence imaging of paintings was developed.

- A new quantification scheme for X-ray fluorescence imaging of biological samples.

- Application of statistical methods for the classification of the benign and malignant adrenal gland tumors on the base of IR spectroscopic data.

- Opracowano nowy algorytm korekty między warstwowych efektów absorpcyjnych występujących przy rentgenowskim obrazowaniu fluorescencyjnym dzieł malarskich.

- Opracowano nową metodę ilościowego obrazowania próbek biologicznych za pomocą rentgenowskiej mikroskopii fluorescencyjnej.

- Odkrycie powiązania pomiędzy specyficznymi metalami śladowymi i ich rolą w lepszej identyfikacji typu nowotworów mózgu i jajników na potrzeby diagnozy i terapii nowotworów.

- Zastosowanie metod statystycznych do klasyfikacji łagodnych i złośliwych guzów nadnerczy na podstawie danych pomiarowych uzyskanych metodą spektroskopii w podczerwieni.

- Wykorzystanie metody całkowitego odbicia promieniowania X do badaniu składu pierwiastkowego próbek pochodzenia środowiskowego i medycznego.

- Instalacja nowego spektrometru Nanohunter II. Sprawdzenie poprawności działania i optymalizacja procesu przygotowania próbek. Wykonanie analiz próbek pochodzenia biologicznego – tłuszczu, osocza, oraz próbek nowotworów.

MOLECULAR BIOPHYSICS AND BIOENERGETICS GROUP
ZESPÓŁ BIOFIZYKI MOLEKULARNEJ I BIOENERGETYKI

- Mutations within the inner part of the photosynthetic reaction center core are responsible for the efficiency of coupling between their donor and acceptor side.
- Stimulatory and inhibitory action of nanoparticles TiO_2(IV) on isolated photosystem II shows oscillatory dependence on increasing concentrations of TiO_2 depending on the type of TIO_2 and the Fe contaminations.
- TIO_2 nanoparticles influence vitamin E content in plants; studies in vivo.
- Identification of novel prenyllipids in plant-derived materials
- Determination tocopherol cyclase's substrate specificity.
- Determination of hydrophobic antioxidants profile in species accessions.
- Very small doses of ionizing radiation modify organization of erythrocyte membrane skeleton and influence oxygen transport by hemoglobin.
- Importance of oxidized form of heme Fe in erythrocytes infected with malaria parasites.
- Observation of temperature-dependent bifurcation of cooperative interactions in pure and enriched in β-carotene DPPC liposomes. Polar carotenoids result in an increase of the adhesion forces within and between lipid bilayers.
- Qualitative analysis of phototrophycally grown bacteria Rhodobacter sphaeroides revealed the presence of microelements generally not considered to be basic in bacterial ionome.
- Quantitative inspection pointed out to Fe as the major trace element in the examined species grown either anaerobically or aerobically. Statistical analysis revealed unexpected relationships between the elements within cells and phototrophic membranes.

- Mutacje wewnątrz rdzenia fotosyntetycznych centrów reakcji są odpowiedzialne za efektywne sprzężenie ich strony donorowej i akceptorowej.
- Stymulacyjne i hamujące działanie nanocząstek TiO_2(IV) na izolowany fotosystem II wykazują oscylacyjną zależność od rosnącego stężenia tlenku tytanu; efekty te silnie zależą od rodzaju TiO_2 i zawartości żelaza.
- Nanocząstki dwutlenku tytanu wpływają na zawartość witaminy E w roślinach; badania in vivo.
- Identyfikacja nowych prenyllipidów w materiale roślinnym.
- Wykazanie specyficznego substratu cyklazy tokoferolu.
- Bardzo małe dawki promieniowania jonizującego modyfikują organizację szkieletu błonowego erytrocytów i wpływają na zdolność hemoglobiny do transportu tlenu;
- Istotna rola utlenionej formy żelaza hemowego w erytrocytach zainfekowanych pasożytami malarii.
- Wykazanie zależnych od temperatury bifurkacji kooperatywnych oddziaływań w czystych DPPC liposomach i wzbogaconych w β-karoten. Polarne karotenoidy powodują wzrost sił adhezji wewnątrz i pomiędzy dwuwarstwami lipidowymi.
- Wykorzystując technikę TXRF przeprowadzono analizę pierwiastkową bakterii fototroficznych Rhodobacter sphaeroides. Stwierdzono, że (i) w próbkach bakterii hodowanych w warunkach anaerobowych występują mikroelementy nie wchodzące w skład podstawowego jonomu bakteryjnego; (II) Fe jest głównym mikroelementem niezależnie od warunków hodowli; (iii) uzyskano informacje dotyczące korelacji pomiędzy pierwiastkami w obrębie komórek i błon fototroficznych.

BIOMEDICAL IMAGING AND MODELLING GROUP
ZESPÓŁ OBRAZOWANIA I MODELOWANIA

- A novel, non-destructive, and cost-effective method to evaluate internal disorders occurring in pears stored under controlled atmosphere (CA) was developed. The method is based on imaging of fruits tissues by low field 0.2 T magnetic resonance imaging system. Obtained by it results of study of spreading of induced changes within the microstructure of the pears as a function of the CA storage time are of considerable importance for optimizing their storage conditions.

- The kinetics of bile acids during extracorporeal liver support therapy were described by one-compartment model with central elimination and constant bile acids generation rate. Model parameters were identified by fitting the model output to experimental data. The results explains bile acids concentration changes in time due to generation rate estimation.

- The research on environmental application of termoluminescent detectors (TLD) has been continued. Influence of external conditions on the MCP-N detectors results were tested. The influence of different TLD preparation method on obtained results was verified.

- The regular study concerning the potential toxicities of selected nanoparticles in living organisms has been started. Early and long-term elemental anomalies occurring in selected body organs as a result of animal exposition to the low doses of magnetic iron oxides nanoparticles were determined.

- Opracowano nowatorską, nieniszczącą i tanią metodę ilościowej oceny dynamiki rozprzestrzeniania się wewnętrznych uszkodzeń tkanki gruszek przechowywanych w kontrolowanej atmosferze (KA). Metoda oparta jest na obrazowaniu tkanek owoców za pomocą niskopolowego systemu obrazowania magnetyczno-rezonansowego 0.2 T. Przeprowadzone badania rozprzestrzeniania się sztucznie wywołanych zmian w mikrostrukturze gruszek w funkcji czasu ich przechowywania w (KA) są istotne dla optymalizacji warunków ich przechowywania.

- Opisano kinetykę kwasów żółciowych podczas pozaustrojowej terapii wątroby wykorzystując model jednokompartmentowy. Parametry modelu były identyfikowane poprzez dopasowanie parametrów wyjściowych modelu do danych eksperymentalnych. Uzyskane wyniki pozwoliły na wytłumaczenie zmian stężenia kwasów żółciowych w czasie, dzięki wyznaczeniu ich tempa generacji.

- Kontynuowano badania nad zastosowaniami środowiskowymi detektorów termoluminescencyjnych (TLD). Testowano wpływ warunków zewnętrznych na wyniki uzyskane dla detektorów MCP-N. Zweryfikowano zależność uzyskiwanych wyników od sposobu przygotowania TLD.

- Rozpoczęto regularne studia dotyczące potencjalnych toksyczności wybranych nanocząstek w żywych organizmach. Określono wczesne i długofalowe anomalia pierwiastkowe zachodzące w wybranych narządach na skutek ekspozycji zwierząt na niskie dawki magnetycznych nanocząstek tlenków żelaza.

- Investigations on the optimization of Photodynamic Therapy of Tumors (PDT) were continued. Simple models of oxygen ($^3O_2$) diffusion in the multi-layer skin models were used to estimate the spatial distribution of O concentration in the tissue. It has been also demonstrated usefulness of fractal dimension of pigmented lesions in classification of various forms of melanoma.
- Research on redox properties of melanins was continued. The interaction of DOPA-melanin (DM) with various oxidizing agents was investigated using EPR spectroscopy and redox potentiometry. The redox mechanism of interaction between strong oxidants and DM was established. A high scavenging ability of melanin against strong oxidizing agents was confirmed. For the first time it was demonstrated that quinone groups determine the redox properties of melanin, electron exchange between the quinone groups and oxidants is a fast process, melanin has a huge redox capacity and the electron transfer reactions of melanins have a cooperative character.
- High Entropy Alloys (HEA) were prepared in the following systems: Al_xFeCrCoNi, Al_xCu_yFeCrCoNi and SnFeCrCoNi-X, X=Al, Ti, V, Mn, Cu, Nb, Mo, Pd, Ag, Ta, W, Re. For all systems two series of alloys were synthesized: by sintering of pure metal powders and using traditional method of melting in an arc furnace. XRD measurements and phase analysis were performed for obtained alloys.
- EDX measurements and phase composition determination were performed for obtained alloys. Mössbauer measurements were performed in the systems Al_xFeCrCoNi(^{57}Fe) and SnFeCrCoNi-X(^{119}Sn).
- Electronic structure calculations were done for the Al_xFeCrCoNi system.

- Kontynuowano badania nad optymalizacją terapii fotodynamicznej nowotworów (PDT). Pokazano użyteczność prostych modeli dyfuzji tlenu w wielowarstwowych modelach skóry do oszacowania przestrzennego rozkładu stężeń tlenu ($^3O_2$) w tkance.
- Kontynuowano badania własności redoksowych melanin. Badano odziaływanie DOPA-melaniny(DM) z różnymi utleniaczami z pomocą spektroskopii EPR i potencjometrii redoksowej. Ustalono mechanizm reakcji redoksowy oddziaływania pomiędzy silnymi utleniaczami i DM. Potwierdzono wysoką zdolność melaniny do zmiatania silnych utleniaczy.Po raz pierwszy pokazano, że: grupy chinonowe określają własności redoksowe melaniny, że wymiana elektronowa pomiędzy grupami chinonowymi i utleniaczami jest szybkim procesem, że melanina posiada ogromna pojemność redoksową, i że reakcje transferu elektronów z udziałem melanin mają charakter kooperatywny.
- Wykonano stopy wysokiej entropii w układach AlxFeCrCoNi, AlxCuyFeCrCoNi oraz SnFeCrCoNi-X, X=Al, Ti, V, Mn, Cu, Nb, Mo, Pd, Ag, Ta, W, Re. We wszystkich układach wykonano serie stopów techniką spiekania proszków oraz serie kontrolne tradycyjną metodą topienia w piecu łukowym. Wykonano pomiary XRD wszystkich otrzymanych stopów i przeprowadzono analizę fazową.
- Wykonano pomiary EDX, oznaczono składy faz oraz ich udziały. Wykonano pomiary mössbauerowskie w układach AlxFeCrCoNi (^{57}Fe) oraz SnFeCrCoNi-X (^{119}Sn)
- Wykonano obliczenia struktury elektronowej w układzie AlxFeCrCoNi

MÖSSBAUER SPECTROSCOPY GROUP
ZESPÓŁ SPEKTROSKOPII MÖSSBAUEROWSKIEJ

- Complete characterization of magnetism in the magnetically strongest -phase Fe-V compound: evidence of its re-entrant (PM-FM-SG) character, determination of figures of merit for the ground state, construction of the magnetic phase diagram in the H-T plane.

- Kompletny opis własności magnetycznych międzymetalicznego związku $Fe_{66}V_{34}$ charakteryzującego się najwyższą wartością temperatury Curie wśród binarnych faz sigma. W szczególności udowodniono, że magnetyzm ma charakter re-entrant (PM?FM?SG), podano pełną charakterystykę stanu podstawowego oraz skonstruowano diagram fazowy w płaszczyźnie H-T.

- Determination of the Debye temperatures, kinetic and potential energies of Fe atoms vibrations and the force constant for the $Fe_{66}V_{34}$ compound.

- Wyznaczono temperatury Debye'a, energię kinetyczną i potencjalną drgań sieciowych atomów Fe oraz stałą siłową dla tychże atomów dla badanego związku.

Activity
Działalność organizacyjna

M.Lankosz

Member of X-Ray Spectrometry Advisory Board (since 2008)

Członek Komitetu Doradczego czasopisma X-Ray Spectrometry (od 2008)

Member of Scientific Council of the Institute of Nuclear Chemistry and Technology (since 2002)

Członek Rady Naukowej Instytutu Chemii I Techniki Jądrowej (od 2002)

Member Committee of Nuclear Technology at the National Atomic Energy Agency (since 2009)

Członek Komitetu Technologie Jądrowe przy Państwowej Agencji Atomistyki

Member of Editorial Board of „Nukleonika" (since 2010)

Członek Komitetu Redakcyjnego czasopisma "Nukleonika" (od 2010) Członek Zespołu interdyscyplinarnego do spraw Programu wspierania infrastruktury badawczej w ramach Funduszu Nauki i Technologii Polskiej

Chairmen of the International Conference on Development and Applications of Nuclear Technologies NUTECH-2017

Przewodniczący Międzynarodowej Konferencji Rozwój i Zastosowania Technologii Jądrowych NUTECH-2017

Member of the interdisciplinary committee for research infrastructure advancement under Polish Science and Technology Fund

Przedstawiciel Wydziału Fizyki i Informatyki Stosowanej AGH w Konsorcjum XFEL-Polska

Representative of Faculty of Physics and Applied Computer Science AGH in the Consortium XFEL-Poland

Ekspert MAEA w Wiedniu

Expert IAEA Vienna

Z. Stęgowski

Chairman of the electoral commission FP&ACS – AGH UST

Przewodniczący okręgowej komisji wyborczej WFiIS - AGH

Vice-Chairman of Enrolment Committee at the Faculty of Physics and Applied Computer Science, AGH

Zastępca Przewodniczącego Wydziałowej Komisji Rekrutacyjnej na Wydziale Fizyki I Informatyki Stosowanej AGH

M.Czyżycki

Member of the European X-ray Spectrometry Association (since 2010)

Członek Europejskiego Stowarzyszenia Spektrometrii Promieniowania Rentgenowskiego (EXSA) (od 2010)

Reviewer for the journals: Spectrochimica Acta Part B: Atomic Spectroscopy, Applied Radiation and Isotopes and Nukleonika

Recenzent w czasopismach: Spectrochimica Acta Part B: Atomic Spectroscopy, Applied Radiation and Isotopes oraz Nukleonika

J. Dudała

Member of the Kraków Branch of the Polish Society of Medical Physics	Członek Oddziału Krakówskiego Polskiego Towarzystwa Fizyki Medycznej
Member of the unit for teaching quality	Członek zespołu ds. Jakości Kształcenia
Assistant Radiation Protection Supervisor at the Faculty of Physics and Applied Computer Science	Zastępca Wydziałowego Inspektora Ochrony Radiologicznej
Radiation Protection Supervisor at the Academic Centre for Materials and Nanotechnology AGH	Inspektor Ochrony Radiologicznej w Akademickim Centrum Materiałów i Nanotechnologii AGH
Reviewer – manuscript in World Journal of Surgical Oncology	Recenzent – manuskrypt w World Journal of Surgical Oncology

L.Furman

Supervisor of students trainings for Technical Physics and Applied Computer Science	Pełnomocnik Dziekana ds. praktyk studenckich na kierunkach Fizyka Techniczna i Informatyka Stosowana
Reviewer for the journals: International Journal of Multiphase Flow, Open Physics	Recenzent czasopism: International Journal of Multiphase Flow, Open Physics

L.Samek

Member of Editorial Board of “European Journal of Environmental Sciences”	Członek Komitetu Redakcyjnego czasopisma “European Journal of Environmental Sciences”
Member of Faculty Enrolment Committee	Członek Wydziałowej Komisji Rekrutacyjnej
Reviewer for X-ray Spectrometry, Analytica Chimica Acta, Science of the Total Environment, Aerosol and Air Quality Research	Recenzent czasopism X-ray Spectrometry, Analytica Chimica Acta, Science of the Total Environment, Aerosol and Air Quality Research

P. Wróbel

Reviewer for the Microchemical Journal	Recenzent w Microchemical Journal
Consultant at the International Atomic Energy Agency	Konsultant Międzynarodowej Agencji Energii Atomowej

A. Surówka

Reviewer for the journals: Journal of Cancer and Clinical Oncology, X-ray Spectrometry	Recenzent czasopism: Journal of Cancer and Clinical Oncology, X-ray Spectrometry

K. Burda

A member of Scientific Committee of the Faculty	Członek Wydziałowej Komisji d/s Nauki
A member of Scientific Council at Multidisciplinary School of Engineering in Biomedicine, AGH University of Science and Technology (since 2009)	Członek Rady Programowej Międzywydziałowej Szkoły Inżynierii Biomedycznej AGH – Akademii Górniczo-Hutniczej (od 2009)
Head of the BIONAN consortium (since 2008)	Kierownik konsorcjum BIONAN (od 2008)
A member of Recall Committee of Privileges for PhD Students at the Faculty	Członek Odwoławczej Komisji Dyscyplinarnej dla Doktorantów na Wydziale Fizyki i Informatyki Stosowanej AGH
A member of Polish Physical Society	Członek Polskiego Towarzystwa Fizycznego
A Treasurer of Polish Hemorheology and Microcirculation Society	Skarbnik Polskiego Towarzystwa Hemoreologii i Mikrokrążenia
Reviewer: Photosynthesis Research, PlosOne, Journal of Molecular Structure, Acta Physiologiae Plantarium, Biochimica et Biophysica Acta, Journal of Physical Chemistry, Radiation and Environmental Biophysics	Recenzent: Photosynthesis Research, PlosOne, Journal of Molecular Structure, Acta Physiologiae Plantarium, Biochimica et Biophysica Acta, Journal of Physical Chemistry, Radiation and Environmental Biophysics

J. Fiedor

Member of the Polish Hemorheology and Microcirculation Society	Członek Polskiego Towarzystwa Hemoreologii i Mikrokrążenia
Member of the International Carotenoid Society	Członek Międzynarodowego Towarzystwa Karotenoidowego
Reviewer in: Photochemical, Photobiological Sciences, and Indian Journal of Experimental Biology	Recenzent w: Photochemical, Photobiological Sciences, Indian Journal of Experimental Biology

A. Orzechowska

A member of Enrolment Committee at the Faculty of Physics and Applied Computer Science, AGH	Członek Wydziałowej Komisji Rekrutacyjnej na Wydziale Fizyki I Informatyki Stosowanej AGH

R.Szymańska

Member of International Society of Photosynthesis Research,	Członek Międzynarodowego Towarzystwa Badań Fotosyntetycznych
Member of Polish Biochemical Society, Polish Botanical Society and Polish Copernicus Society	Członek Polskiego Towarzystwa Biochemicznego, Polskiego Towarzystwa Botanicznego i Polskiego Towarzystwa Przyrodników im. Kopernika
Reviewer: Plant Physiology, Plant Physiology and Biochemistry, Environmental and Experimental Botany, Springer Plus, Molecular Biology Reports, Oxidative Medicine and Cellular Longevity	Recenzent: Plant Physiology, Plant Physiology and Biochemistry, Environmental and Experimental Botany, Springer Plus, Molecular Biology Reports, Oxidative Medicine and Cellular Longevity
Leader Guest Editor in a Special Issue of Oxidative Medicine and Cellular Longevity entitled “Plant-derived antioxidants in disease prevention”	Leader Guest Editor w specjalnym wydaniu czasopisma Oxidative Medicine and Cellular Longevity zatytułowanym “Plant-derived antioxidants in disease prevention”

Z.Matuszak

President of Cracow Branch of the Polish Biophysical Society	Prezes Krakówskiego Oddziału Polskiego Towarzystwa Biofizycznego
Member of the Radiobiology and Radiation Hygiene Team, Committee of Medical Physics, Radiobiology and Imaging Diagnosis, Department V Medical Sciences, Polish Academy of Sciences	Członek Zespół ds. Radiobiologii i Higieny Radiacyjnej, Komitet Fizyki Medycznej, Radiobiologii i Diagnostyki Obrazowej, Wydział V Nauk Medycznych PAN
Member of Polish Electron Magnetic Resonance Group (PG EMR)	Członek Polskiej Grupy Elektronowego Rezonansu Magnetycznego (PG EMR)
Member of the Faculty Election Committee	Członek Wydziałowej Komisji Wyborczej,
Member of the Faculty Commission for Didactic Audit	Członek Wydziałowej Komisji ds. Audytu Dydaktycznego
Reviewer for Acta Physica Polonica A	Recenzent czasopisma: Acta Physica Polonica A

J. Chwiej

Head of the Department of Medical Physics and Biophysics	Kierownik Katedry Fizyki Medycznej i Biofizyki
Supervisor of the KERMA Scientific Association of Medical Physics Students	Opiekun Studenckiego Koła Naukowego Fizyków Medycznych KERMA
Member of the Polish Society of Medical Physic	Członek Polskiego Towarzystwa Fizyki Medycznej
Member of the Faculty Commission for the Research Equipment	Członek Wydziałowej Komisji ds. Aparatury
Reviewer for journals: Metallomics, Journal of Trace Elements in Medicine and Biology, NeuroImage, Talanta (The International Journal of Pure and Applied Analytical Chemistry)	Recenzent czasopism: Metallomics Journal of Trace Elements in Medicine and Biology, NeuroImage, Talanta (The International Journal of Pure and Applied Analytical Chemistry)

J.Cieślak

Dean's Plenipotentiary for Quality of Education	Pełnomocnik Dziekana ds. Jakości Kształcenia
Member of the Faculty Commission for awards	Członek komisji ds. Nagród
Member of the faculty commissions for administrative competition for the position of science teaching and learning	Członek komisji konkursowych na stanowiska naukowo-dydaktyczne i dydaktyczne
Reviewer for journals: Solid State Phenomena, Journal of Alloys and Compounds, Nukleonika, Advances in Technology Innovation	Recenzent czasopism: Solid State Phenomena, Journal of Alloys and Compounds, Nukleonika, Advances in Technology Innovation

A.Jung

Vice Chairman of the Kraków Branch of the Polish Society of Medical Physics	Zastępca Przewodniczącego Oddziału Krakówskiego Polskiego Towarzystwa Fizyki Medycznej
Coordinator of educational cooperation with Nałęcz Institute Biocybernetics and Biomedical Engineering Polish Academy of Sciences	Koordynator w zakresie współpracy dydaktycznej z Instytutem Biocybernetyki i Inżynierii Biomedycznej im. Macieja Nałęcza PAN
Reviewer for ASAIO Journal	Recenzent czasopisma ASAIO Journal
Member of Polish Radiation Research Society	Członek Polskiego Towarzystwa Badań Radiacyjnych
Member of Polish Society for Biomedical Engineering	Członek Polskiego Towarzystwa Inżynierii Biomedycznej
Member of the Faculty Library Commission	Członek Wydziałowej Komisji Bibliotecznej

K.Matusiak

Member of the Polish Society of Medical Physics	Członek Polskiego Towarzystwa Fizyki Medycznej
Deputy chairman of the Faculty Commission for Education Quality at the Faculty of Physics and Applied Computer Science	Zastępca przewodniczącego zespołu ds. Jakości Kształcenia na Wydziale Fizyki i Informatyki Stosowanej AGH
Dean's Plenipotentiary for the students practice for the Medical Physics (WFiIS)	Pełnomocnik Dziekana ds. praktyk studenckich dla kierunku Fizyka Medyczna (WFiIS)
	Członek Rady Wydziału

S.Dubiel

Member of the University's Senate Commission for Discipline of Students	Członek Senackiej Komisji ds. Dyscyplinarmych Studentów
Fellow of the Institute of Physics, London (since 2002)	Członek Instytutu Fizyki w Londynie w randze Fellow
Member of the Mössbauer Century Club, USA (since 2005)	Członek Mössbauer Century Club, USA
Reviewer for Journal of Alloys and Compounds, Journal of Magnetism and Magnetic Materials, Journal of Materials Science, Hyperfine Interactions, Croat. Chem. Acta	Recenzent czasopism Journal of Alloys and Compounds, Journal of Magnetism and Magnetic Materials, Journal of Materials Science, Hyperfine Interactions, Croat. Chem. Acta
Member of the Editorial Board for Applied Sciences	Członek Komitetu Redakcyjnego czasopisma Applied Sciences
Prinicpal investigator of the IREMEV project within the EUROfusion Consortium	Kierownik zadania badawczego w ramach projektu IREMEV realizowanego przez Konsorcjum EUROfusion
Member of the International Advisory Board for 2nd Mediterranean Conference for the Applications of the Mössbauer Effect, MECAME 2016, Cavtat, Croatia	Członek Międzynarodowego Komitetu Doradczego dla 2nd Mediterranean Conference for the Applications of the Mössbauer Effect, MECAME 2016, Cavtat, Croatia

Department of Condensed Matter Physics
Katedra Fizyki Materii Skondensowanej

Head

prof. dr hab.inż Krzysztof Wierzbanowski full profesor

prof. dr hab. Stanisław Kaprzyk full professor

prof. dr hab. inż. Wojciech Łużny full professor.

prof. dr hab. Wiesława Sikora full professor

prof. dr hab. Janusz Wolny full professor

prof. dr hab. inż. Janusz Toboła full professor

prof. dr hab. inż. Andrzej Zięba professor.

prof. dr hab. inż. Andrzej Baczmański professor.

dr hab. inż. Jacek Tarasiuk associate professor.

dr hab. inż. Andrzej Bernasik associate professor

dr inż. Paweł Armatys assistant professor

dr inż. Jakub Haberko assistant professor

dr Jacek Nizioł assistant professor

dr Lucjan Pytlik assistant professor

dr inż. Maciej Śniechowski assistant professor

dr inż. Bartłomiej Wiendlocha assistant professor

dr inż. Marcin Wroński assistant professor

dr inż. Sebastian Wroński assistant professor

dr inż. Mariusz Jędrychowski teaching assistant

dr inż. Marianna Marciszko teaching assistant (till 31/03/2016)

dr inż. Radosław Strzałka teaching assistant

dr inż. Roman Wawszczak teaching assistant

dr inż. Jan Kulka assistant professor

Ryszard Skotnicki

Profile

Scientific activities of the Department are mainly focused on the following topics:

Properties and symmetry analysis of selected phases of ordered structures

Studies of aperiodic structures

Deformation, recrystallization and internal stresses in polycrystalline materials. Study of bones and porous materials structure.

Electronic structure, transport and magnetic properties of the solid state.

Polymer research.

Theory of measurement uncertainty.

Własności i analiza symetryczna wybranych faz struktur uporządkowanych

Badanie struktur aperiodycznych.

Odkształcenia, rekrystalizacja oraz naprężenia wewnętrzne w materiałach polikrystalicznych. Badanie struktury kości i materiałów porowatych.

Struktura elektronowa, własności transportowe i magnetyczne ciał stałych.

Badania polimerów.

Teoria niepewności pomiarów.

Achievements
Osiągnięcia

For model 1D and 2D systems the Debye-Waller correction for phasons in quasicrystals was found to fail and worsen refinement results. The new approach for correcting diffraction peaks with respect to phasons was proposed based on a statistical method and proofed to work successfully.

The new improved version of the MODY software, used for symmetrical analysis of the ordered structures phases, was developed.

Synchrotron diffraction measurements and a new version model of self-consistent model were used to examine the process of damage and the resulting heterogeneity of stress distribution in plastically deformed duplex steel.

Rozwinięto ulepszoną wersję programu MODY służący do analizy symetrycznej faz struktur uporządkowanych.

Na modelowych strukturach 1D i 2D wykazano, że standardowa poprawka Debye'a-Wallera na fazony w kwazikryształach pogarsza wynik dopasowania modelu do danych dyfrakcyjnych. Zaproponowano nową metodę korekcji natężenia pików dyfrakcyjnych w oparciu o model statystyczny i wykazano jego skuteczność.

Na podstawie synchrotronowych badań dyfrakcyjnych oraz nowej wersji modelu samouzgodnionego zbadano proces zniszczeń oraz wynikające z niego niejednorodności rozkładu naprężeń występujące podczas odkształcenia plastycznego stali dwufazowej.

The mechanical properties and microstructure of titanium and copper plastically deformed in the processes of uniaxial tension and asymmetric rolling were examined.

The method of residual stress determination in wood by digital volume correlation (DVC) was developed.

The discovery of superconductivity in $CaBi_2$ compound and interpretation of its mechanism based on the theoretical analysis of the anisotropy of the interatomic bonds and the influence of spin-orbit coupling on the electronic structure of the compound.

Pioneering calculations of the electronic structure and electron-phonon coupling of the first superconducting high entropy alloy $Ta_34Nb_33Hf_8Zr_14Ti_{11}$.

Experimental and theoretical investigations of the effect of vibration anharmonicity on the superconducting temperature increase in MV_2Al_{20} (M= Sc, Lu, Y) compounds, on the basis of the analysis of the electronic, dynamic and superconducting properties.

The new structural model of PANI/CSA conducting polymer system has been refined by use of advanced method of artificial intelligence (so called swarm algorithms) and confirmed experimentally by the neutron diffraction on partially deuterated samples.

Zbadano własności mechaniczne i mikrostrukturę tytanu i miedzi odkształcanych plastycznie w procesach rozciągania jednoosiowego oraz walcowania asymetrycznego.

Rozwinięto metodę wyznaczania naprężeń w drewnie metodą cyfrowej korelacji objętości (ang.: DVC).

Pionierskie obliczenia struktury elektronowej i sprzężenia elektron-fonon pierwszego nadprzewodzącego stopu o wysokiej entropii $Ta_34Nb_33Hf_8Zr_14Ti_{11}$.

Doświadczalne i teoretyczne zbadanie wpływu anharmoniczności drgań na wzrost temperatury nadprzewodzącej w związkach MV_2Al_{20} (M= Sc, Lu, Y) na podstawie analizy własności elektronowych, dynamicznych i nadprzewodzących.

Nowy model struktury polimeru przewodzącego PANI/CSA został dopracowany dzięki zastosowaniu zaawansowanych metod sztucznej inteligencji (tzw. algorytmów stadnych) i potwierdzony eksperymentalnie metodą dyfrakcji neutronowej na próbkach częściowo podstawionych deuterem.

Odkrycie nadprzewodnictwa w związku $CaBi_2$ oraz interpretacja jego mechanizmu na podstawie teoretycznej analizy anizotropii wiązań międzyatomowych i wpływu sprzężenia spin-orbita na strukturę elektronową związku.

Activity

Działalność organizacyjna

P. Armatys

Deputy Dean for Students Affairs	Prodziekan ds. Studenckich.

A. Baczmański

Member of Scientific Committees of International Conferences: "European Conference on Residual Stresses (ECRS)" and "Size-Strain Conference",	Członek Komitetów Naukowych Międzynarodowych Konferencji: European Conference on "Residual Stresses (ECRS)" oraz "Size-Strain oraz Size and Strain",
Reviewer of : Materials Sciences and Engineering, Journal of Applied Crystallography,	Recenzent czasopism: Materials Sciences and Engineering, Journal of Applied Crystallography,
Member of the Election Committee of the Faculty,	Członek Wydziałowej Komisji Wyborczej,
Member of the Committee for the Research Equipment of the Faculty,	Członek Wydziałowej Komisji Aparaturowej .
-Member of the Board IV for Scientific Research of AGH University of Science and Technology.	Członek IV Zespołu ds. badań naukowych AGH

W. Łużny

Vice-Rector of AGH UST for Education (since 01.09.2016),	Prorektor AGH ds. Kształcenia (od 01.09.2016),
Member of the Senate of AGH University of Science and Technology,	Senator AGH,
Chairman of the AGH Senate Committee for Budget (till 31.08.2016),	Przewodniczący Senackiej Komisji ds. Budżetu (do 31.08.2016)

Representative of AGH UST in the Council of Scientific - Industrial Consortium “ELA-MAT Pokarpackie”

Reprezentant AGH w Radzie Uczestników Konsorcjum Naukowo-Przemysłowym „ELA-MAT Podkarpackie”,

Member of the Scientific Committee of M. Smoluchowski Scientific Consortium ”Matter-Energy-Future” (KNOW),

Członek Rady Naukowej Krakówskiego Konsorcjum Naukowego im. M. Smoluchowskiego „Materia – Energia – Przyszłość” (KNOW),

Member of the Commission for the future employment of assistant professors.

Członek Wydziałowej Komisji ds. rotacji adiunktów.

W. Sikora

Member of Committee of Crystallography, Polish Academy of Science,

Członek Komitetu Krystalografii Polskiej Akademii Nauk,

Member of Commission on Magnetic Structures of the International Union of Crystallography,

Członek Komisji Struktur Magnetycznych Międzynarodowej Unii Krystalograficznej,

Member of Polish Society of Neutron Diffraction.

Członek Polskiego Towarzystwa Rozpraszania Neutronów.

J. Toboła

Head of Doctoral Studies in Physics,

Kierownik Studiów Doktoranckich z Fizyki ,

Member of The University Electoral Collegium,

Członek Uczelnianego Kolegium Elektorów,

Member of International Scientific Committees of Conferences organized by the European Thermoelectrical Society and the International Union of Crystallography.

Członek Międzynarodowych Komitetów Naukowych konferencji organizowanych przez Europejskie Towarzystwo Termoelektryczne oraz Międzynarodową Unię Krystalograficzną.

K. Wierzbanowski

Head of the Department of Condensed Matter Physics,	Kierownik Katedry Fizyki Materii Skondensowanej,
Chairman of the Board IV for Scientific Research of AGH University of Science and Technology,	Przewodniczący Zespołu IV Badań Naukowych AGH,
Member of the University Election Committee,	Członek Uczelnianej Komisji Wyborczej,
Member of International Scientific Committees of Conferences on: Mechanical Stress Evaluation by Neutrons and Synchrotron Radiation (MECA SENS),	Członek międzynarodowych komitetów naukowych organizujących konferencje z cyklu: Mechanical Stress Evaluation by Neutrons and Synchrotron Radiation (MECA SENS),
Member of the Board of Reviewers in: Archives of Metallurgy and Materials.	Członek komitetu recenzentów czasopisma Archives of Metallurgy and Materials.

J. Wolny

Dean of the Faculty	Dziekan Wydziału,
Member of the AGH Senate,	Senator AGH,
Member of Committee of Crystallography, Polish Academy of Science,	Członek Komitetu Krystalografii Polskiej Akademii Nauk,
Member of Commission on Aperiodic Structure of the International Union of Crystallography,	Członek Komisji Struktur Aperiodycznych Międzynarodowej Unii Krystalograficznej,
Director of postgraduate studies for teachers,	Kierownik Studiów podyplomowych dla nauczycieli na AGH,
Deputy chairman of the Central Committee of the "Olympiad with diamond index of AGH".	Zastępca przewodniczącego Komitetu Głównego „Olimpiady o Diamentowy Indeks AGH".

A. Zięba

Polish Physical Society: member of the Main Board,	Polskie Towarzystwo Fizyczne: członek Zarządu Głównego,
Reviewer of Metrology and Measurement Systems, and Pomiary, Automatyka Kontrola,	Recenzent Metrology and Measurement Systems, oraz Pomiary, Automatyka Kontrola,
Scientific supervisor of the Undergraduate Student Laboratory.	Opiekun naukowy studenckiej Pracowni Fizycznej.

J. Tarasiuk

Rector's representative for quality of teaching,	Pełnomocnik Rektora ds. Jakości Kształcenia,
Member of the jury for Lecture Notes in Internet, under the patronage of the Rector,	Członek jury konkursu pod patronatem JM Rektora Notatki w Internecie,
Member of the Program Centre for Distance Education at AGH University,	Członek Rady Programowej Ośrodka Edukacji Niestacjonarnej AGH,
Member of the reward jury for the quality of teaching Sapere Auso - Małopolska Scholarship Foundation.	Członek Komisji Nagrody Jakości Nauczania Sapere Auso - Małopolskiej Fundacji Stypendialnej.

Department of Applied Informatics and Computational Physics

Katedra Informatyki Stosowanej i Fizyki Komputerowej

Head

prof. dr hab. Krzysztof Kułakowski, (till 1.11.2016) full profesor

prof. dr hab. Zdzisław Burda (since 1.11.2016), full professor

Complex Systems Group

Zespół Układów Złożonych

prof. dr hab. Zdzisław Burda, full professor

prof. dr hab. Krzysztof Kułakowski, full professor

dr hab. inż. Przemysław Gawroński, assistant professor

dr hab. inż. Małgorzata Krawczyk, assistant professor

dr hab. inż. Krzysztof Malarz, assistant professor

dr inż. Piotr Gronek, assistant professor

dr inż. Maciej Wołoszyn, assistant professor

dr inż. Antoni Dydejczyk, senior lecturer

dr inż. Barbara Kawecka-Magiera, senior lecturer

dr inż. Grażyna Krupińska, senior lecturer

dr inż. Janusz Malinowski, lecturer

mgr inż. Michał Dwużnik, assistant

Nanostructures and Nanodevices Theory Group

Zespół Teorii Nanostruktur i Nanourządzeń

prof. dr hab. Stanisław Bednarek, full professor

prof. dr hab. Janusz Adamowski, full professor

prof. dr hab. inż. Bartłomiej Szafran, professor

dr hab. inż. Tomasz Chwiej, assistant professor

dr hab. inż. Bartłomiej Spisak, assistant professor

dr inż. Paweł Wójcik, teaching assistant

dr inż. Michał Nowak, teaching assistant

dr inż. Paweł Szumniak, teaching assistant

dr inż. Jarosław Pawłowski, teaching assistant

Information Technology and Systems Research Group

Zespół Technik Informacyjnych i Badań Systemowych

prof. dr hab. inż. Piotr Kulczycki, full professor

prof. László T. Kóczy, visiting professor

dr inż. Piotr Andrzej Kowalski, assistant professor

dr inż. Szymon Łukasik, assistant professor

dr inż. Joanna Świebocka-Więk, teaching assistant

mgr inż. Dominika Gołuńska, teaching assistant

mgr inż. Jakub Kamiński, teaching assistant

Profile

COMPLEX SYSTEMS GROUP

Zespół Układów Złożonych

We conduct research on emergence and complexity and on interdisciplinary applications of statistical mechanics and game theory to modeling of sociological processes and to financial engineering as well as to system biology and biophysics. We work in the field of random matrices and complex networks. We also carry out research on micromagnetism in collaboration with laboratories of material science at the Universidad del Pais Vasco, San Sebastian, and Instituto de Ciencia de Materiales de Madrid, CSIC. In particular, we concentrate on modeling of hysteresis loops in micro- and nanoscopic systems.

Prowadzimy badania nad emergencją i złożonością oraz interdyscyplinarnymi zastosowaniami fizyki statystycznej i teorii gier do modelowania zjawisk społecznych oraz inżynierii finansowej jak również do biologii systemowej i biofizyki. Pracujemy w dziedzinie macierzy losowych i sieci złożononych. Prowadzimy również badania mikromagnetyzmu we współpracy z laboratoriami fizyki materiałowej z Universidad del Pais Vasco, San Sebastian, Instituto de Ciencia de Materiales de Madrid, CSIC. W szczególności zajmujemy się modelowaniem pętli histerezy układów mikro- i nanoskopowych.

NANOSTRUCTURES AND NANODEVICES THEORY GROUP
Zespół Teorii Nanostruktur i Nanourządzeń

We conduct research on: quantum computer logic gates, electron transport in semiconductor nanowires and bilayer semiconductor nanostructures, superconductivity in the nanoscale. We model spintronics devices, semi- and superconductor nanodevices. We study spin-orbit coupling effects in quantum dots, spin and charge transport in mesoscopic systems, applications of the nonclassical distribution functions in the context of electronic states in the phase space.

Prowadzimy badania kwantowych bramek logicznych, transportu elektronów w nanodrutach półprzewodnikowych i dwuwarstwowych nanostrukturach półprzewodnikowych, nadprzewodnictwa w strukturach nanoskopowych oraz badania dotyczące modelowania przyrządów spintroniki, urządzeń półprzewowdnikowych i nadprzewodnikowych, efektów oddziaływań spin-orbita w kropkach kwantowych, transportu spinu i ładunku w układach mezoskopowych. Stosujemy metodę nieklasycznych funkcji rozkładu do badania stanów elektronowych w przestrzeni fazowej.

INFORMATION TECHNOLOGY AND SYSTEMS RESEARCH GROUP
Zespół Technik Informacyjnych i Badań Systemowych

We carry out highly specialized investigations into broadly understood information technology and systems research, in particular that pertaining to data analysis and exploration, computational intelligence, biometrics and automatic control engineering. The work is conducted in close cooperation with the Systems Research Institute of the Polish Academy of Sciences in Warsaw.

Prowadzimy wysokospecjalizowane badania w zakresie szeroko rozumianych technik informacyjnych i badań systemowych, w szczególności związanych z analizą i eksploracją danych, inteligencji obliczeniowej, biometryki, a także inżynierii sterowania. Prace prowadzone są w ścisłej współpracy z Instytutem Badań Systemowych Polskiej Akademii Nauk w Warszawie.

ACHIEVEMENTS / OSIĄGNIĘCIA

COMPLEX SYSTEMS GROUP / Zespół Układów Złożonych

Analysis of the eigenvector and eigenvalue statistics for products of random matrices	Zbadano statystykę wektorów własnych i wartości własnych dla iloczynów macierzy losowych
Description of statistical properties of evolution pathways on realistic mutational networks	Opisano statystyczne własności dróg ewolucji na realistycznych sieciach mutacji
Formulation of a simple statistical non-equilibrium macro-economic model simulating the effect of taxation on wealth distribution	Sformułowano prosty statystyczny makroekonomiczny model nierównowagowy symulujący wpływ podatków na rozkład bogactwa
Research on possibilities of driving domain walls in nanoscopic ribbons with cubic anisotropy by external factors	Zbadano teoretycznie możliwości napędzania ścianek domenowych w nanotaśmach z anizotropią kubiczną za pomocą czynników zewnętrznych
Reproduction of administrative regions in USA from data on children names	Odtworzono regiony w USA z danych dot. imion dzieci
Design of a cellular automaton with hysteresis and its application in organization theory	Konstrukcja automatu komórkowego z histerezą i zastosowanie go w teorii organizacji
Modeling of scientific memes in network of papers/authors and their classification	Modelowanie memów naukowych w sieci prac/autorów i ich klasyfikacja
Construction of a game of power through control of resources	Konstrukcja gry o władzę poprzez kontrolę zasobów
Research on the cult of personality, displayed by data on children names	Badanie kultu jednostki poprzez analizę danych o imionach dzieci
The surface of unstable fixed points for two competing processes on Watts-Strogatz network was determined	Wyznaczono powierzchnia punktów niestabilinych dla dwóch konkurujących procesow na sieci Wattsa-Strogatza
A new model of collusions in an organization was proposed	Zapropowano nowy model zmowy w organizacjach

NANOSTRUCTURES AND NANODEVICES THEORY GROUP
Zespół Teorii Nanostruktur i Nanourządzeń

Theory of the nonclassical distribution function in phase space to investigate the localization phenomena of one-electron states in a finite disordered systems.

Teoria nieklasycznych funkcji rozkładu w przestrzeni fazowej do badania procesu lokalizacji stanów jednoelektronowych w ograniczonych układach nieuporządkowanych

Description of multiple Andreev reflections in two dimensional electron gas Josephson junctions

Opis wielokrotnych odbić Andreeva w złączu Josephsona zrealizowanym na dwuwymiarowym gazie elektronowym

Modeling of Adreev-enhancement of quantum point contact with a normalsuperconductor interface

Modelowanie wzmocnienia konduktancji kwantowego kontaktu punktowego przez interfejs półprzewodnik-nadprzewodnik

Computer simulations of the resonant Landau-Zener transitions in the new spin transistor design based on the helical magnetic field.

Symulacje komputerowe rezonansowego przejścia Landaua-Zenera w nowym typie tranzystora spinowego opartego na helikalnym polu magnetycznym

Purpose the spin separator based on the Y-shaped semiconductor nanostructure with the quantum point contact.

Zaproponowanie modelu separatora spinów opartego na nanostrukturze półprzewodnikowej typu Y z kwantowym kontaktem punktowym.

Study of the orbital effect on the magnetic critical field in superconducting nanofilms

Zbadanie wpływu efektu orbitalnego na magnetyczne pole krytyczne w cienkich warstwach nadprzewodzących

Show that in superconducting nanowires the unconventional superconducting phase Fulde-Ferrel can be induced by the orbital effect.

Wykazanie, że w nanodrutach nadprzewodzących niekonwencjonalna faza nadprzewodząca Fulde- Ferella może być indukowana efektem orbitalnym

Theory of obtaining the long-distance entanglement of two spin qubits

Symulacja uzyskania stanów splątanych spinowych kubitów dwóch przestrzennie rozdzielonych elektronów

Electrically controlled long distance entanglement of mobile electron soliton spin qubits in gated nanodevices

Elektryczna kontrola daleko-zasięgowego splatania pomiędzy spinami mobilnych solitonów elektronowych w bramkowanych nanourządzeniach

Determination of influence of temporary magnetic hybridization on electron's dynamic in quantum wires	Opis wpływu krótkoczasowej hybrydyzacji magnetycznej na dynamikę elektronu w drutach kwantowych
Description of the magnetoresistance sign changes in heterogeneous semiconductor nanowires	Opis zmian znaku magnetooporu niejednorodnych nanodrutów półprzewodnikowych
Description of the anomalous Andreev reflections in ferromagnet/conical magnet/superconductor junctions	Opis anomalnych odbić Andreeva w złączach ferromagnetyk/ferromagnetyk o namagnesowaniustożkowym/ nadprzewodnik
Study of the influence of the inter- and intra-subbandspin- orbit interaction on the spin transistor action in Datta and Das architecture	Zbadanie wpływu wewnątrz oraz międzypasmowego oddziaływania spin-orbita na działanie tranzystora spinowego
A model of the electrically-controlled spin transistor based on the helical magnetic field	Zaproponowanie modelu tranzystora spinowego w helikalnym polu magnetycznym z elektrycznie indukowaną akcją tranzystorową
Explanation of the FFLO phase in the superconducting nanofilms	Wyjaśnienie istnienia fazy FFLO w nanowarstwach nadprzewodzących

INFORMATION TECHNOLOGY AND SYSTEMS RESEARCH GROUP
Zespół Technik Informacyjnych i Badań Systemowych

Applications of nonparametric estimation methods for data analysis and decision support	Zastosowania metod estymacji nieparametrycznej do analizy danych i wspomagania decyzji
Properties of advanced metaheuristics based on biological mechanisms	Własności zaawansowanych metaheurystyk opartych na mechanizmach biologicznych
Fuzzy models of computational support in processes for reaching group consensus	Rozmyte modele metod obliczeniowych wspomagających proces osiągania konsensusu w grupie
Image processing for medical diagnosis	Przetwarzanie obrazów dla celów diagnostyki medycznej
Modelling of hierarchical structures properties	Modelowanie własności struktur hierarchicznych

Activity
Działalność organizacyjna

J.Adamowski

Member of the Committee of Ethics at the AGH University of Science and Technology	Członek Komisji Etyki AGH
Member of Program Council of the Laboratory of Physical Fundamentals of Information Processing	Członek Rady Programowej Laboratorium Fizycznych Podstaw Przetwarzania Informacji
Referee of scientific journals: Physical Review Letters, Physical Review B etc.	Recenzent czasopism naukowych: Physical Review Letters, Physical Review B i innych

S. Bednarek

Member of the Physics Committee of the Polish Academy of Sciences	Członek Komitetu Fizyki PAN
Referee of scientific journals: Physical Review Letters, Physical Review B etc.	Recenzent czasopism naukowych: Physical Review Letters, Physical Review B i innych

Z.Burda

Secretary of Commission of Complex Systems of the Polish Academy of Arts and Sciences	Sekretarz Komisji Układów Złożonych Polskiej Akademii
Chairman of the Kraków Branch Council of the Polish Physical Society (2014-16)	Przewodniczący Zarządu OK Polskiego Towarzystwa Fizycznego (kadencja 2014-16)
Referee of scientific journals: Physics Reports, Physical Review Letters, Physical Review etc.	Recenzent czasopism naukowych: Physics Report, Physical Review Letters, Physical Review i innych

T. Chwiej

Referee of scientific journals: Semiconductor Science and Technology, Journal of Physics: Condensed Matter etc.	Recenzent czasopism naukowych: Semiconductor Science and Technology, Journal of Physics: Condensed Matter i innych
Member of the Faculty Board for Quality of Education	Członek Wydziałowej Komisji do Zapewnienia Jakości Kształcenia

P.Gawroński

Referee of scientific journal: Journal of Magnetism and Magnetic Materials	Recenzent czasopisma naukowego: Journal of Magnetism and Magnetic Materials
Member of Faculty Electoral College	Członek Wydziałowego Kolegium Elektorów

M.J.Krawczyk

Referee of scientific journals: OpenPhysics, Scientometrics	Recenzent czasopism naukowych: OpenPhysics, Scientometrics
Member of the Faculty Electoral Board	Członek Okręgowej Komisji Wyborczej

M.K.Kułakowski

Member of Committee of Complex Systems in the Polish Academy of Arts and Sciences	Członek Komisji Układów Złożonych PAU

Expert for the National Centre for Research and Development	Ekspert Narodowego Centrum Badań i Rozwoju
Member of scientific committees of scientific journals	Członek komitetów naukowych czasopism naukowych
Member of program committee of Doctoral Symposium on Recent Advances in Information Technology (DS-RAIT 2016),	Członek komitetu programowego Doctoral Symposium on Recent Advances in Information Technology (DS-RAIT 2016)
Member of program committee of International Conference on Computer Networks and Communication Technology (CNCT2016)	Członek komitetu programowego International Conference on Computer Networks and Communication Technology (CNCT2016)
Member of program committee of International Conference Theory and Practice in Modern Computing (TPMC 2017).	Członek komitetu programowego International Conference Theory and Practice in Modern Computing (TPMC 2017).
Member of scientific organizations, including IEEE, IEEE Computational Intelligence Society,IEEE Systems Council, IEEE Biometrics Council, Polish Information Processing Society.	Członek organizacji naukowych, w tym IEEE, IEEE Computational Intelligence Society, IEEE Systems Council, IEEE Biometrics Council, Polskie Towarzystwo Informatyczne.
Reviewer of numerous scientific journals including Journal of Dynamic Systems, Measurement and Control, Algorithms, Artificial Intelligence Review, Neural Computing and Applications, Pattern Recognition Letters	Recenzent czasopism naukowych m.in. Journal of Dynamic Systems, Measurement and Control, Algorithms, Artificial Intelligence Review, Neural Computing and Applications, Pattern Recognition Letters

P.Kulczycki

Head of the Division for Information Technology and Biometry	Kierownik Zespołu Technik Informatycznych i Biometrii
Head of the Center of Information Technology for Data Analysis Methods, Systems Research Institute, Polish Academy of Sciences	Kierownik Centrum Informatycznych Metod Analizy Danych, Instytutu Badań Systemowych PAN
Member of the Committee of Automation and Robotics of the Polish Academy of Sciences	Członek Komitetu Automatyki i Robotyki Polskiej Akademii Nauk
Member of the Commission of Electrical Engineering, Computer Science and Automatic Control of the Kraków Branch of the Polish Academy of Sciences	Członek Komisji Elektrotechniki, Informatyki i Automatyki PAN, Oddział w Krakówie
Member of Scientific Council of the Systems Research Institute, Polish Academy of Sciences	Członek Rady Naukowej Instytutu Badań Systemowych PAN
Member of numerous program committees of scientific journals, Editor-in-Chief of two	Członek wielu komitetów programowych czasopism naukowych, w tym dwóch Editor-in-Chief
Referee of numerous reputable scientific journals	Recenzent wielu renomowanych czasopism naukowych
Member of numerous program committee of scientific conferences	Członek wielu komitetów programowych konferencji naukowych
Member of 10 scientific organizations, including IFAC Technical Committee “Distributed Parameter Systems” and Senior Member IEEE	Członek 10 organizacji naukowych, w tym IFAC Technical Committee „Distributed Parameter Systems” oraz Senior Member IEEE

S. Łukasik

Expert for the National Centre for Research and Development and European Commission (Horizon 2020)	Ekspert Narodowego Centrum Badań i Rozwoju oraz Komisji Europejskiej (program Horyzont 2020)
Member of the program board of the Association of TOP 500 Innovators	Członek Rady Programowej Stowarzyszenia Top 500 Innovators
Reviewer of reputable scientific journals, e.g. Information Sciences, Applied Soft Computing, IET Computer Vision and Journal of Intelligent and Fuzzy Systems	Recenzent dla renomowanych czasopism naukowych, m.in. Information Sciences, Applied Soft Computing, IET Computer Vision i Journal of Intelligent and Fuzzy Systems
Member of scientific organizations, including IEEE, IEEE Computational Intelligence Society	Członek organizacji naukowych, w tym IEEE, IEEE Computational Intelligence Society

M.Nowak

PostDoc at QuTech (Director: Leo Kouwenhoven), TU Delft	PostDoc w QuTech (Dyrektor: Leo Kouwenhoven) na Universytecie Technicznym Delft
Referee of Physical Review Letters, Physical Review etc.	Recenzent Physical Review Letters, Physical Review i innych

B.Spisak

Referee of scientific journals: AIP Advances, Journal of Chemical Physics, Physica A, etc.	Recenzent czasopism naukowychAIP Advances, Journal of Chemical Physics, Physica A, etc.
Member of the Auditing Commission at the Kraków Branch Council of the Polish Physical Society	Członek Komisji Rewizyjnej Oddziału Krakówskiego Polskiego Towarzystwa Fizycznego

K. Malarz

Deputy Dean for Education (since 2016/09)	Prodziekan ds. Kształcenia (od 2016/09)
Senior Editor, Open Physics (since 2014/04)	Redaktor Open Physics (od 2014/04)
Editor, International Journal of Statistical Mechanics (2013/01-2016/07)	Redaktor International Journal of Statistical Mechanics (2013/01-2016/07)
Editor, The Scientific World Journal: Computer Science (since 2013/12-2016/07)	Redaktor The Scientific World Journal: Computer Science (2013/12-2016/07)
Member at the Ministry of Science and Higher Education, Group for Sciences and Engineering to assess applications for funds for statutory activity	Członek Zespołu Specjalistycznego Nauk Technicznych i Ścisłych (ZS-3) do oceny wniosków o przyznanie środków finansowych na działalność statutową, MNiSzW
Member of the Kraków branch Council, Polish Physical Society (since 2016)	Członek zarządu oddziału Krakówskiego Polskiego Towarzystwa Fizycznego
Member of the Auditorial Commission for Section of Physics in Economy and Social Sciences, Polish Physical Society (since 2009)	Członek Komisji Rewizyjnej Sekcji Fizyki w Ekonomii i Naukach Społecznych Polskiego Towarzystwa Fizycznego (od 2009)
	Członek Zarządu Oddziału Krakówskiego Polskiego Towarzystwa Fizycznego (od 2016)
Referee of scientific journals: Physical Review Letters, Physical Review E, Physica A, The Physical European Journal B, International Journal of Modern Physics C, Journal of Artificial Societies and Social Simulation, Computer Physics Communications, Physica D, Modern Physics Letters B	Recenzent czasopism naukowych: Physical Review Letters, Physical Review E, Physica A, The Physical European Journal B, Journal of Artificial Societies and Social Simulation, Computer Physics Communications, Physica D, Modern Physics Letters B
Member of the International Program Committee of the Duke Forest Conference 2016 (Durham, North Carolina, USA, 2016)	Członek międzynarodowego komitetu programowego „The Duke Forest Conference 2016" (Durham, North Carolina, USA, 2016)
Member of the Program Committee of the 1st International Conference on Complex Information System (Rome, IT, 2016)	Członek międzynarodowego komitetu programowego „The 1st International Conference on Complex Information System" (Rzym, 2016)

B.Szafran

Technical editor of this document	Osoba łamiąca ten tekst

M.Wołoszyn

Member of the Examination Board for Final Exam for Computer Science Students	Członek Komisji d/s przeprowadzenia egzaminu inżynierskiego na kierunku Informatyka Stosowana
Referee of scientific journal: Journal of Non-Crystalline Solids	Recenzent czasopisma naukowego: Journal of Non-Crystalline Solids

P.Wójcik

Member of the Young Scientists Committee – Advisory Board of Ministry of Science and Higher Education	Członek Rady Młodych Naukowców - organu doradczego MNiSW
Referee on scientific journals: Physcial Review B, Journal of Applied Physics, Physica B, Central European Physics, International Journal of Modern Physics B	Recenzent w czasopismach Physcial Review B, Journal of Applied Physics, Physica B, Central European Physics, International Journal of Modern Physics B

Department of Particle Interaction and Detection Techniques

Katedra Oddziaływań i Detekcji Cząstek

Head

prof. dr hab. inż. Dąbrowski Władysław, full professor

Elementary Particles Physics Group

Zespół Fizyki Cząstek Elementarnych

prof. dr hab.Kisielewska Danuta, full professor

prof. dr hab. inż. Przybycień Mariusz, profesor

dr hab. inż. Grabowska-Bołd Iwona, assistant professor

dr hab. inż. Szumlak Tomasz, assistant professor

dr inż. Adamczyk Leszek, assistant professor

dr inż. Bołd Tomasz, assistant professor

dr inż. Gach Grzegorz, assistant professor

dr inż. Guzik Marcin, teaching assistant

dr inż. Obłąkowska-Mucha Agnieszka, assistant professor

dr inż. Rachwał Bartłomiej, assistant

Nuclear Electronics and Radiation Detection Group

Zespół Elektroniki Jądrowej i Detekcji Promieniowania

prof. dr hab. inż. Dąbrowski Władysław, full professor

prof. dr hab. inż. Idzik Marek, professor

dr inż. Fiutowski Tomasz, assistant professor

dr inż. Hottowy Paweł, assistant professor

dr inż. Kowalski Tadeusz, assistant professor

dr inż. Mindur Bartosz, assistant professor

dr inż. Moroń Jakub, assistant professor

dr inż. Skoczeń Andrzej, assistant professor

dr inż. Świentek Krzysztof, assistant professor

dr inż. Wiącek Piotr, assistant professor

dr inż. Koperny Stefan, teaching assistant

dr inż. Firlej Mirosław, assistant

dr Imran Ahmed Mohammed, assistant

mgr inż. Łach Bartłomiej, assistant

mgr inż. Korba Andrzej

inż. Terlecki Przemysław

Profile

The scientific activity of Department covers three areas of research:

- basic research of elementary constituents of the matter and their interactions in high energy collisions,
- design and construction of detectors and readout electronics for high energy physics experiments,
- development of detectors and readout electronics for neuroscience experiments and for medical imaging.

The high energy physics experiments are long term projects and because of the high cost of large accelerators and detection facilities they are performed by large international collaborations. Our participation in these experiments is as complete as possible and covers all phases of the projects: preparations of the research programs, design and construction of the experimental apparatus, data analyses as well as maintaining and upgrading detector systems.

Tematyka naukowa Katedry obejmuje trzy kierunki badań:

- badania podstawowe elementarnych składników materii i ich oddziaływań metodą zderzeń wysokoenergetycznych wiązek,
- rozwój detektorów i aparatury elektronicznej dla eksperymentów fizyki wysokich energii,
- projektowanie i budowę detektorów i aparatury elektronicznej dla eksperymentów neurobiologicznych oraz dla obrazowania medycznego.

Eksperymenty wysokich energii są projektami długofalowymi, a budowa akceleratorów i aparatury detekcyjnej wymaga dużych nakładów finansowych prace z dziedziny fizyki cząstek elementarnych mogą być prowadzone tylko w ramach dużych międzynarodowych zespołów. Nasz udział w eksperymentach obejmuje wszystkie ich fazy od przygotowania programu fizycznego poprzez projektowanie i budowę elementów aparatury detekcyjnej, jej obsługę i modernizację, po analizę danych.

Since mid of 1990's the Department members participated in design and construction of new experiments at the LHC accelerator at CERN:

- ATLAS p-p, p-Pb and Pb-Pb,
- LHCb p-p and p-Pb,

and after start of the LHC in 2010 they contribute to running of the experiments and to data analysis. A special attention is paid to processes leading to New Physics, particularly to Higgs and supersymmetric particles discoveries in ATLAS experiment, to study of CP violation in beauty and charm sector in the LHCb experiment to explain matter - antimatter asymmetry of the Universe. Also, search for rare decays of mesons containing b and c quarks that can also be sensitive to phenomena beyond Standard Model is performed. Since 2011 Department participates in the STAR p-p and ion-ion experiment on the relativistic heavy ion interactions at the RHIC accelerator in Brookhaven National Laboratory.

The activity in the area of detectors and readout electronics focuses on development of position sensitive detectors and readout systems employing Application Specific Integrated Circuits. These projects are carried out in collaboration with individual abroad partners as well as in the frame of large international projects:

- ATLAS and LHCb Detectors upgrade
- RD50 – Radiation hard semiconductor devices for very high luminosity colliders,
- RD51 – Development of micro-pattern gas detector technologies.
- International Linear Collider – ILC,
- Compact Linear Collider – CLIC.

Od połowy lat 90-tych pracownicy Katedry uczestniczyli w projektowaniu i budowie aparatury dla eksperymentów na akceleratorze LHC w CERN-ie:

- ATLAS: p-p, p-Pb i Pb-Pb
- LHCb: p-p, p-Pb

a od 2010 roku, po uruchomieniu LHC, uczestniczą w prowadzeniu eksperymentów i analizie danych. Celem eksperymentów na LHC jest bezpośrednie odkrycie obiektów związanych z tzw. Nową Fizyką. Badania odkrytej w 2012 roku cząstki Higgsa oraz poszukiwania cząstek supersymetrycznych są priorytetowym zadaniem eksperymentu ATLAS. Precyzyjne pomiary stopnia łamania symetrii CP oraz obserwacje rzadkich rozpadów w eksperymencie LHCb mogą również prowadzić do odkrycia Nowej Fizyki i wyjaśnić asymetrię pomiędzy materią i antymaterią. Poszukiwania rzadkich rozpadów mezonów zawierających kwarki b są czułym narzędziem w badaniu zjawisk poza Modelem Standardowym. Od 2011 roku Katedra uczestniczy w eksperymencie STAR (oddziaływania p-p i jądro-jądro) na akceleratorze relatywistycznych ciężkich jonów RHIC w BNL.

Działalność w dziedzinie elektroniki koncentruje się na rozwoju detektorów pozycjoczułych i systemów odczytu detektorów z wykorzystaniem techniki specjalizowanych układów scalonych. Prace te prowadzone są we współpracy z partnerami zagranicznymi:

- Modernizacja detektorów ATLAS i LHCb
- RD50 - Radiation hard semiconductor devices for very high luminosity colliders
- RD51 – Development of micro-pattern gas detector technologies
- International Linear Collider – ILC
- Compact Linear Collider – CLIC.

In the area of neuroscience we develop systems for imaging of neural activity in live neural tissues, including retina and cortex. A common aim of various research projects carried out in collaboration with neuroscientists is to develop techniques for bidirectional communication between live neurons and electronic circuits.

W dziedzinie badań neurobiologicznych rozwijane są systemy do obrazowania aktywności neuronalnej w żywych tkankach nerwowych, takich jak siatkówka oka i kora mózgowa. Wspólnym celem różnych projektów badawczych prowadzonych we współpracy z neurobiologami jest opracowanie dwukierunkowej komunikacji pomiędzy żywymi neuronami i obwodami elektronicznymi.

Achievements / Osiągnięcia

- The STAR experiment measured the transverse single-spin asymmetry of weak boson production in transversely polarized proton-proton collisions which is sensitive to the, so called, Sivers function, one of the transverse momentum-dependent parton distribution functions in the proton. (publ. Phys. Rev. Lett.)

- Eksperyment STAR zmierzył tzw. poprzeczną pojedynczą asymetrię spinową w produkcji bozonów elektrosłabych w zderzeniach poprzecznie spolaryzowanych wiązek protonów. Wielkość ta jest czuła na tzw. Funkcję Siversa, jedną z funkcji rozkładu partonów w protonie zależną od pędu poprzecznego partonów.

- The ATLAS experiment continued data taking for proton-proton collisions at the energy of 13 TeV with the record data-taking efficiency which lead to record integrated luminosity. In fall proton-lead collisions were provided at two energies 5.02 TeV and 8.16 TeV per nucleon pair. The AGH UST group was very active in preparation of software and was coordinating trigger configuration preparation for heavy-ion collisions.

- Eksperyment ATLAS kontynuował zbieranie danych proton-proton przy energii 13 TeV z rekordowo wysoką wydajnością zbierania danych, która doprowadziła do rekordowej całkowitej świetlności. Jesienią eksperyment zebrał dane ołów-proton przy energiach 5.02 TeV i 8.16 TeV na parę nukleonów. Grupa z AGH aktywnie uczestniczyła w przygotowaniu oprogramowania i koordynowała prace nad przygotowaniem konfiguracji trygera dla zderzeń ciężkich jonów.

- Leading contribution to the R&D of the High Level Trigger software for Phase 1 and Phase 2 of the ATLAS experiment upgrade.

- Wiodący wkład do prac rozwojowych nad oprogramowaniem trygera wysokiego poziomu dla Fazy 1 i Fazy 2 modernizacji eksperymentu ATLAS.

- Leading part in Pb-Pb, p-Pb and p-p data analysis in the ATLAS experiment: measurements of "ridge" in the small systems and development of the new technique to subtract peripheral background, multiplicity density in the p-Pb system, multiplicity correlations in pseudorapidity, and preparation of publications (one Physical Review Letter, two Physics Letters B, and one paper in European Physical Journal C),

- Installation of ATLAS Forward Proton (AFP) detectors. After several years of conceptual work and detector construction the new detectors based on the Roman Pot technique for tagging of the beam protons scattered at very small angles were installed in the beginning of 2016, and first data with this new setup were taken in the autumn.

- Contribution to test-beam activities for the Upstream Tracker (UT) detector of the modernised LHCb spectrometer. Measurement of the spatial resolution of the prototype silicon sensors as function of the track angle and dose.

- Successful grant application regarding radiation damage studies for semiconductor position-sensitive detectors in the frame of RD50 collaboration.

- Multivariate (MVA) algorithms for the $B_sD_s(D_s\gamma) + K$ and $B_sD_s + K$ signal selection

- Wiodący udział w analizie danych oddziaływań Pb-Pb, p-Pb oraz p-p w eksperymencie ATLAS: pomiar korelacji długozasięgowych dla dwóch cząstek tzw. "ridge" w małych układach, wprowadzenie nowej metody odjęcia tła od przypadków peryferycznych, pomiar krotności produkcji cząstek naładowanych w zderzeniach p-Pb oraz korelacji w pseudorapidity oraz przygotowanie publikacji całej współpracy na te tematy (jedna publikacja w Physical Review Letters, dwie w Physics Letters B, jedna w European Physical Journal C).

- Układ detektorów eksperymentu ATLAS został rozszerzony o detektory AFP wykorzystujące technikę "garnków rzymskich" do rejestracji protonów rozproszonych pod bardzo małymi kątami. Detektory te zostały zainstalowane na początku roku 2016 po długim okresie przygotowań i konstrukcji, a następnie zostały wykorzystane podczas specjalnych okresów zbierania danych jesienią 2016.

- Udział w testach na wiązce protonowej prototypowych elementów detektora Upstream Tracker (UT) dla zmodernizowanego spektrometru LHCb. Analiza danych – pomiar przestrzennej zdolności rozdzielczej prototypowych sensorów UT w funkcji kąta padania cząstek oraz dawki promieniowania.

- Grant finansowany przez Narodowe Centrum Nauki na prace związane z badaniem wpływu zniszczeń radiacyjnych na pracę półprzewodnikowych detektorów pozycjo-czułych w ramach współpracy RD50.

- Wielomodalna (MVA) selekcja rozpadów $B_sD_s(D_s\gamma) + K$ and $B_sD_s + K$.

- Analysis of soft non-diffraction QCD processed leading to exclusive central production of ($pp \to p\pi\pi p$)

- Development (design, fabrication and test measurements) of a full 128-channel prototype of SALT – the readout ASIC for Upstream Tracker of LHCb experiment

- Project, fabrication and test measurements of 8-channel prototype of FLAME ASIC – dedicated integrated circuit in CMOS 130 nm technology, for the readout of silicon luminosity detector in future lepton linear collider

- Development of prototype monolithic silicon detector in SOI 200 nm technology, including test measurements on proton beam at CERN, for tracking in future particle physics experiments

- Development and verification of a position sensitive X-ray detector based on GEM (Gas Electron Multiplier) technology with reduced copper layer coverage.

- Analiza miękkich niedyfrakcyjnych procesów QCD prowadzących do ekskluzywnej produkcji ($pp \to p\pi\pi p$).

- Rozwój (projekt, produkcja oraz pomiary testowe) pełnego 128-kanałowego prototypu SALT – dedykowanego układu scalonego do odczytu detektora Upstream Tracker w eksperymencie LHCb.

- Projekt i produkcja oraz pomiary testowe 8-kanałowego układu FLAME – dedykowanego układu scalonego w technologii CMOS 130 nm, do odczytu sensorów krzemowych w detektorze świetlności przyszłego zderzacza liniowego leptonów.

- Rozwój prototypowego krzemowego detektora monolitycznego w technologi SOI 200 nm, wraz z testami na wiązce protonowej w CERN, do pomiarów w przyszłych eksperymentach fizyki cząstek.

- Opracowanie i weryfikacja koncepcji pozycjo-czułego detektora promieniowania X opartego na technologii GEM (Gas Electron Multiplier) ze zredukowaną warstwą miedzi.

Activity

D. Kisielewska

Member of Scientific Council of the National Centre for Nuclear Research (2015-2019)	Członek Rady Naukowej Narodowego Centrum Badań Jądrowych, Świerk (2015-2019)
Member of Experts Team SI-NZ-1 in Commission for Science, Engineering and Life Sciences in Committee for Evaluation of Scientific Units (2014-2016)	Członek Zespołu Ewaluacji Jednostek Naukowych do spraw nauk ścisłych i inżynierskich oraz nauk o życiu SI-NZ-1 (2014 – 2016)
Member of the ST2 panel in the National Science Centre	Członek panelu ST2 w Narodowym Centrum Nauki

W. Dąbrowski

Member of the Consortium Council of the National Centre for Hadron Radiotherapy.	Członek Rady Zarządzającej Narodowego Centrum Radioterapii Hadronowej
Member of the editorial board of the Journal of Instrumentation.	Członek komitetu redakcyjnego czasopisma Journal of Instrumentation
Representative of AGH-UST in the Scientific Committee of the Scientific-Industrial Consortium „ELA-MAT Podkarpackie”	Reprezentant AGH w Komitecie Naukowym Konsorcjum Naukowo-Przemysłowego „ELA-MAT Podkarpackie”
Representative of the polish member groups (AGH-UST, Jagiellonian University and Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences) in the the Upgrade Advisory Board of the ATLAS collaboration	Reprezentant polskich grup (WFiIS AGH, UJ, IFJ PAN) w komitecie doradczym do modernizacji eksperymentu ATLAS

T. Bołd

Deputy coordinator of Heavy Ion Trigger Menu Forum of the ATLAS experiment, CERN	Reprezentant WFiIS w komitecie Trigger/DAQ eksperymentu ATLAS, CERN
Member of Trigger/DAQ Institute Board in ATLAS experiment, CERN	Zastępca koordynatora systemu wyzwalania dla danych ciężko-jonowych w eksperymencie ATLAS, CERN
Coordinator of TDAQ Software Upgrade of the ATLAS experiment	Koordynator zespołu "TDAQ Software Upgrade" w eksperymencie ATLAS
ATLAS Trigger DAQ speakers committee member	Członek komitetu koordynującego wystąpienia konferencyjne dotyczące systemu wyzwalania i akwizycji danych eksperymentu ATLAS

M. Idzik

Deputy Coordinator of FCAL (International Collaboration for Forward Detectors in future Linear Collider ILC/CLIC)	Zastępca Koordynatora międzynarodowej współpracy FCAL (Forward Detectors in Future Linear Colliders ILC/CLIC)
Coordinator of the SALT readout ASIC development for LHCb Upgrade Upstream Trackere	Koordynator projektu układu odczytu SALT dla LHCb Upstream Tracker

B. Mindur

Team leader of Kraków RD51 group at CERN.	Koordynator grupy Krakówskiej w ramach współpracy RD51 w CERN
Member of TRT Institute Board in ATLAS experiment at CERN	Reprezentant WFiIS w komitecie TRT eksperymentu ATLAS w CERN

I. Grabowska-Bołd

Representative of AGH-UST and Jagellonian University in Collaboration Board of the ATLAS experiment at CERN	Reprezentant WFiIS AGH-UST/UJ w Radzie Współpracy ATLAS w CERN
Coordinator of Heavy Ion Trigger Menu Forum of the ATLAS experiment, CERN	Koordynator systemu wyzwalania dla danych ciężkojonowych w eksperymencie ATLAS, CERN
Deputy coordinator of Heavy Ion Working Group of the ATLAS experiment	Zastępca koordynatora Grupy Fizyki Ciężkich Jonów eksperymentu ATLAS

T. Szumlak

Honorary Fellowship position with School of Physics and Astronomy - University of Glasgow (2013-2016)	Honorowy członek kolegium Szkoły Fizyki i Astronomii Uniwersytetu w Glasgow
Honorary Fellowship position in the School of Physics and Astronomy - University of Manchester (2014 - 2016)	Honorowy członek kolegium Szkoły Fizyki i Astronomii Uniwersytetu w Manchester
The Kraków VELO group leader (2013 - 2016)	Koordynator krakowskiej grupy LHCb oraz VELO (VErtex LOcator)
LHCb Upgrade Coordinator for Poland (2013 - 2016)	Koordynator modernizacji eksperymentu LHCb w Polsce

L. Adamczyk

Convener of the “Standard Model – Soft QCD and Diffraction” in ATLAS experiment	Collaboration Board of the STAR experiment at BNL
Convener of the software, simulation and integration group of ATLAS AFP project	
Member of ATLAS AFP project Management Board	
Representative of AGH-UST/IFJ PAN in	

Kordynator zespołu dyfrakcyjnych analiz z wykorzystaniem pomiaru protonów rozproszonych pod bardzo małymi katami w eksperymencie ATLAS	Członek zarządu grupy "detektorów do przodu" we współpracy ATLAS
Koordynator zespołu odpowiedzialnego za oprogramowanie i symulacje w projekcie AFP eksperymentu ATLAS	Członek zarządu projektu AFP we współpracy ATLAS

M. Przybycień

Representative of AGH-UST and Jagellonian University in Collaboration Board of the ZEUS experiment at DESY	Reprezentant WFiIS AGH-UST/UJ w Radzie Współpracy ZEUS w DESY

G. Gach

Coordinator of the ALFA data preparation of the ATLAS experiment	Koordynator przygotowania danych z detektora ALFA w eksperymencie ATLAS

Department of Applied Nuclear Physics

Katedra Zastosowań Fizyki Jądrowej

Head

prof. dr hab. Kazimierz Różański (till 1.11.2016) full profesor

prof. dr hab. Piotr Bożek, (since 1.11.2016), full professor

Physics of Functional Materials Group

Zespół Fizyki Materiałów Funkcjonalnych

prof. dr hab. Pszczoła Jarosław, full professor

Environmental Physics Group

Zespół Fizyki Środowiska

prof. dr hab. inż. Różański Kazimierz, full professor

dr hab inż. Duliński Marek, assistant professor

dr hab inż. Nguyen Dinh Chau, assistant professor

dr hab inż. Przybyłowicz Wojciech, assistant professor

dr inż. Nęcki Jarosław, assistant professor

dr inż. Wachniew Przemysław, assistant professor

dr inż. Zimnoch Mirosław, assistant professor

dr Bolewski Andrzej, assistant professor

dr inż. Ciechanowski Marek, assistant professor

dr inż. Nowak Jakub, teaching assistant

dr inż. Bartyzel Jakub, teaching assistant

dr inż. Michał Gałkowski, teaching assistant

dr inż. Gorczyca Zbigniew, teaching assistant

dr inż. Jodłowski Paweł, teaching assistant

dr. inż. Chmura Łukasz, scientific assistant

dr inż. Marcin Kapusta

mgr inż. Marzec Michał

Robert Czub

Wróblewski Ryszard

Physics of Strongly Interacting Systems Group

Zespół Fizyki Układów Silnie Oddziałujących

prof. dr hab. Bożek Piotr, full professor

dr hab. Bzdak Adam, assistant professor

dr Czapliński Wilhelm, assistant professor

Profile

Department of Applied Nuclear Physics (DANP) is composed of three groups: (i) Environmental Physics Group, (ii) Physics of Functional Materials Group, and (iii) Physics of Strongly Interacting Systems Group. Research activities of DANP cover selected topics of nuclear physics and their applications in areas such as environmental sciences, material sciences as well as industrial applications of nuclear methodologies. DANP is active also in fundamental research related to properties and dynamics of many-body systems such as neutron stars and heavy ion collisions at intermediate and ultra-relativistic energies. Moreover, DANP is strongly involved in teaching in the framework of the disciplines of Technical Physics, Medical Physics and Applied Informatics, being offered by the Faculty at B.Sc. and M.Sc. level.

Katedra Zastosowań Fizyki Jądrowej składa się z trzech zespołów badawczych: (i) Zespołu Fizyki Środowiska, (ii) Zespołu Fizyki Materiałów Funkcjonalnych, oraz (iii) Zespołu Fizyki Układów Silnie Oddziałujących. Badania naukowe prowadzone w Katedrze obejmują wybrane zagadnienia fizyki jądrowej w kontekście jej zastosowań w naukach o środowisku, naukach o materiałach, a także obejmują przemysłowe zastosowania metod jądrowych. Ponadto, w Zespole Układów Silnie Oddziałujących prowadzone są badania podstawowe dotyczące dynamiki układów silnie oddziałujących (gwiazdy neutronowe, zderzenia jąder o pośrednich i skrajnie relatywistycznych energiach). Katedra i jej zespoły są silnie zaangażowane w dydaktykę specjalistyczną prowadzoną na Wydziale ramach kierunku Fizyka Techniczna, Fizyka Medyczna oraz Informatyka Stosowana, na obu stopniach studiów.

Major instrumentation:

- an arc melting system with contact-less ignition for synthesis of materials,
- a Czochralski system for synthesis of monocrystals,
- a system to measure electrical resistivity,
- a system to measure magnetostriction,
- a measuring system for magnetoelectric effect,
- an electrical poling system
- electrolytic enrichment system for low-level tritium assay in natural waters,
- analytical systems for determination of trace gas concentrations in the atmosphere,
- analytical system to measure fluxes of trace gases exchanged between the atmosphere and the ground surface
- analytical systems for determination of stable isotope ratios of light elements (H, C, O, N) in environmental materials,
- liquid scintillation spectrometers for measurements of low-level activities of selected radionuclides (^{3}H, ^{14}C, ^{90}Sr, ^{210}Pb, ^{222}Rn, isotopes of uranium, thorium and radium) in environmental materials,
- low-level gamma spectrometry for measurements of low-level activities of selected radionuclides in environmental materials,
- Analytical set-up for measuring neutron parameters of materials.

Ważniejsza aparatura naukowa będąca w posiadaniu Katedry:

- układ do syntezy materiałów w łuku elektrycznym z bezkontaktowym zapłonem,
- aparatura Czochralskiego do otrzymywania monokryształów,
- układ do pomiaru oporności elektrycznej,
- układ do pomiaru magnetostrykcji,
- aparatura do pomiaru efektu magnetoelektrycznego,
- układ do elektrycznego polaryzowania
- aparatura do elektrolitycznego wzbogacania prób wody w tryt;
- systemy analityczne do pomiaru gazów śladowych w atmosferze;
- system analityczny do pomiaru strumieni gazów śladowych wymienianych miedzy atmosferą i powierzchnią ziemi;
- systemy analityczne do pomiaru stosunków izotopowych pierwiastków lekkich (H, C, O, N) w różnych matrycach;
- system do pomiaru aktywności naturalnych i sztucznych nuklidów gamma-promieniotwórczych w próbkach stałych i ciekłych z wykorzystaniem spektrometrii gamma;
- spektrometry ciekło-scyntylacyjne do pomiarów niskich aktywności izotopów promieniotwórczych (^{3}H, ^{14}C, ^{90}Sr, ^{210}Pb, ^{222}Rn, izotopy uranu, toru i radu);
- stanowisko pomiarowe do pomiarów parametrów neutronowych materiałów.

Achievements / Osiągnięcia

Finding anomalous correlations in fourth cumulants of baryons measured in relativistic heavy-ion collisions	Stwierdzenie istnienia niestandardowych korelacji w kumulantach czwartego rzędu rozkładu barionów w relatywistycznych zderzeniach jądrowych
Application of carbon and nitrogen isotope analyses of total suspended particulate matter in Kraków air for source attribution research	Zastosowanie składu izotopowego węgla i azotu do identyfikacji źródeł pyłu zawieszonego w atmosferze Krakówa
Mobile measurements of suspended particulate matter PM10 in southern Poland (Kraków agglomeration, southern Malopolska and Upper Silesia region)	Mobilne pomiary stężeń pyłów zawieszonych PM10 w obrębie Krakówa, Podhala oraz Górnego Śląska
Synthesis and studies of new $Tb_{0.27}$ $Dy_{0.73}$ (Fe/Al)2 materials with giant magnetostriction.	Synteza i badanie właściwości nowych materiałów $Tb_{0.27}Dy_{0.73}$ (Fe/Al)2 posiadających ogromną magnetostrykcję.

Activity / Działalność organizacyjna

P.Bożek

Member of Committee of Physics, Polish Academy of Science.	Członek Komitetu Fizyki Polskiej Akademii Nauk

Ch. Nguyen Dinh

Member of the Editorial Board of the International Journal of Nuclear Energy Science and Engineering (since 2011)	Członek zespołu redakcyjnego czasopisma "International Journal of Nuclear Energy Science and Engineering"
Member of the Editorial Board of Journal of Pollution Effects & Control.	Członek zespołu redakcyjnego czasopisma "Journal of Pollution Effects & Control"

K. Różański

Member of the Polish National Committee, International Geosphere and Biosphere Programme of the International Council for Science, Polish Academy of Science.	Członek Polskiego Komitetu ds. Współpracy z Międzynarodowym Programem Badań Geosfery i Biosfery Międzynarodowego Komitetu Nauki, przy Prezydium Polskiej Akademii Nauk
Member of the Editorial Board of the journal "Isotopes in Environmental and Health Studies (since 2000)	Członek komitetu redakcyjnego czasopisma "Isotopes in Environmental and Health Studies (od 2000 roku)
Vice-chairman of the Society of Research on Environmental Changes "GEOSPHERE"	Vice-prezes Towarzystwa Badania Przemian Środowiska "GEOSFERA"
Member of the Council of School of Environment Protection and Engineering, AGH University	Członek Rady Szkoły Ochrony i Inżynierii Środowiska im. Walerego Goetla AGH
Chair of Disciplinary Commission for Academic and Research Staff at AGH University	Przewodniczący Komisji Dyscyplinarnej ds. Nauczycieli Akademickich AGH

PhD students / Doktoranci

Name	Year	Supervisor
Biało Izabela	1	prof. dr hab. inż. Andrzej Kozłowski
Chudyba Monika	1	prof. dr hab. inż. Władysław Dąbrowski
Jurczyk Jakub	1	prof. dr hab. Czesław Kapusta
Lechowicz-Sobiło Joanna	1	dr hab. Zenon Matuszak
Leśnicki Jan	1	prof. dr hab. Stanisław Bednarek
Majewski Witold	1	dr hab. inż. Tomasz Szumlak
Michoń Dagmara	1	prof. dr hab. inż. Tadeusz Pisarkiewicz prof. dr hab. Kvetoslava Burda
Paszcza Paweł	1	dr hab. Zenon Matuszak
Pierchała Anna	1	prof. dr hab. inż. Kazimierz Różański
Pitala Krzysztof	1	dr hab. inż. Marcin Sikora
Rybski Michał	1	prof. dr hab. inż. Janusz Toboła
Suchecki Maciej	1	prof. dr hab. Konrad Szaciłowski
Zawal Piotr	1	prof. dr hab. Konrad Szaciłowski
Bugański Ireneusz	2	prof. dr hab. Janusz Wolny
Chęciński Jakub	2	prof. dr hab. Tomasz Stobiecki
Gorokh Vladimir	2	prof. dr hab. Konrad Szaciłowski
Janus Piotr	2	prof. dr hab. inż. Mariusz Przybycień
Jarosiński Łukasz	2	prof. dr hab. inż. Marek Przybylski
Jasiewicz Kinga	2	prof. dr hab. inż. Janusz Toboła
Jurczyk-Sitko Anna	2	prof. dr hab. Czesław Kapusta
Kołodziej Karolina	2	prof. dr hab. inż. Władysław Dąbrowski
Kozik Tomasz	2	prof. dr hab. inż. Wojciech Łużny
Krauze Daria	2	prof. dr hab. inż. Marek Lankosz
Kremer Jakub	2	dr hab. inż. Iwona Grabowska-Bołd
Krysiak Sonia	2	prof. dr hab. Kvetoslava Burda
Kuciakowski Juliusz	2	dr hab. inż. Marcin Sikora
Pawlak Jakub	2	prof. dr hab. inż. Marek Przybylski
Borkowski Karol	3	prof. dr hab. Henryk Figiel
Bugiel Szymon	3	prof. dr hab. inż. Marek Idzik
Ciołek Gabriel	3	prof. dr hab. Szymon Peszat
Dasgupta Roma	3	prof. dr hab. inż. Marek Idzik
Dendek Adam	3	dr hab. inż.. Tomasz Szumlak
Dróżdż Piotr	3	dr hab. Tomasz Ślęzak
Fulek Łukasz	3	prof. dr hab. inż. Mariusz Przybycień
Goc Kamil	3	prof. dr hab. Czesław Kapusta
Górski Michał	3	prof. dr hab. Stanisław Bednarek
Grzelak Maria	3	prof. dr hab. inż. Marek Lankosz
Kuczyńska Marika	3	prof. dr hab. inż. Marek Idzik

Name	Year	Supervisor
Prendota Witold	3	prof. dr hab. Czesław Kapusta
Sikora Rafał	3	prof. dr hab. inż. Mariusz Przybycień
Skoczeń Agnieszka	3	dr hab. inż. Joanna Chwiej
Skowron Grzegorz	3	prof. dr hab. Stanisław Bendarek
Szypulska Małgorzata	3	prof. dr hab. inż. Władysław Dąbrowski
Duong Van Hao (stypendysta UNESCO)	3	dr hab. inż. Chau Nguyen Dinh
Czechowska Magdalena	3	dr hab. inż. Chau Nguyen Dinh
Poliński Michał	3	dr hab. inż. Zdzisław Stęgowski
Buczkowski Mateusz	4	prof. dr hab. inż. Khalid Saeed
Kolasiński Krzysztof	4	prof. dr hab. inż. Bartłomiej Szafran
Mreńca Alina	4	prof. dr hab. inż. Bartłomiej Szafran
Osika Edyta	4	prof. dr hab. inż. Bartłomiej Szafran
Zięba Damian	4	prof. dr hab. inż. Kazimierz Różański
Chodyń Maciej	5	prof. dr hab. Janusz Wolny
Giebułtowski Marek	5	dr hab. Marek Woch
Kamiński Jakub	5	dr hab. inż. Jacek Tarasiuk
Kłodowski Krzysztof	5	prof. dr hab. Henryk Figiel
Matlak Barbara	5	dr hab. Tomasz Ślęzak
Pilarczyk Kacper	5	dr hab. Konrad Szaciłowski
Strączek Tomasz	5	prof. dr hab. Czesław Kapusta
Surówka Artur	5	dr hab. inż. M. Szczerbowska-Boruchowska
Wach Elżbieta	5	prof. dr hab. inż. Bartłomiej Szafran
Wiśnios Damian	5	prof. dr hab. Józef Korecki
Żebrowski Dariusz	5	prof. dr hab. inż. Bartłomiej Szafran

Overall Human Mortality and Morbidity due to Exposure to Air Pollution

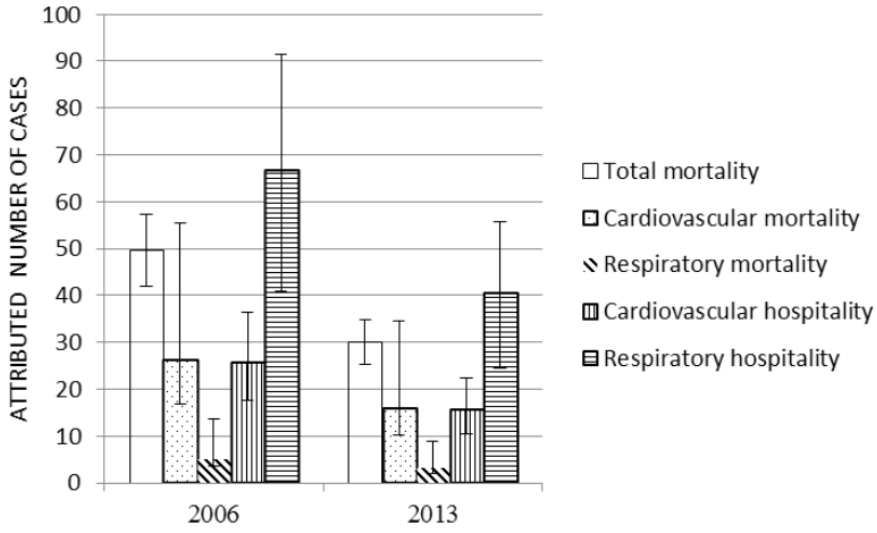
L. Samek

AGH University of Science and Technology, Kraków, Poland
Faculty of Physics and Applied Computer Science
Department of Medical Physics and Biophysics,

The current level of ambient air pollution continues to be high, although it is decreasing from year to year. The species which are being most extensively studied are PM10, PM2.5 and NO_2 . The concentration of SO_2 remains at a relatively low level compared to that representative of the previous century, following a significant decrease of SO_2 concentration in air during that period of time. Different pollutants may have significantly different exposure-response characteristics [1]. PM10 are "thoratic" particles that can penetrate into the lower respiratory system. PM2.5 are "respirable" particles that can penetrate into the gas-exchange region of the lungs [2]. Although individual air pollutants can exert their own specific toxic effects on the respiratory and cardiovascular systems ozone, nitrogen oxides and suspended particulates all share the common property of being potential oxidants, either through direct effects on lipids and proteins or indirectly through the activation of intracellural oxidant pathways [2]. Air pollution can cause increasing hospital admissions for respiratory and cardiovascular diseases, asthma attacks, acute bronchitis and lung function decline. Premature mortality and morbidity may be a result of exposure to polluted air.

In this study, AirQ software [3] was employed to determine the dependence of total mortality, respiratory track mortality, cardiovascular mortality as well as hospital admissions, both due to respiratory track diseases and cardiovascular illnesses, on the exposure to PM10, PM2.5, and NO_2 in Kraków, Poland. Data consisting of concentrations of PM10, PM2.5 and NO_2 was used in this study. This data was obtained from the website of the Voivodeship Inspectorate for Environmental Protection (WIOS) in Kraków [4]. Data from WIOS in Kraków was pre-processed prior to being input to the AirQ software Values for total mortality, cardiovascular mortality, respiratory mortality, hospital admissions due to cardiovascular diseases and hospital admissions due to respiratory diseases) attributed to exposure to PM10 were calculated. The relevant studies were performed for Kraków inhabitants during the 2005 – 2013 period. The population of Kraków was 756 000 at the time when the research was carried out. Values were calculated per 100 000 inhabitants and were determined with a 95% confidence level. Total mortality due to exposure to PM10 in 2005 was 41 deaths per 100 000 and dropped to 30.1 deaths in 2013. Cardiovascular mortality due to exposure to PM10 was two times lower then total mortality. The number of hospital admission attributed to cardiovascular diseases was three times as high as cardiovascular mortality. However, hospital admissions due to respiratory diseases were more than ten times higher than the number of respiratory mortalities. There were 55 and 4.2 cases, respectively, in 2005, and 40 and 3.1 cases, respectively, in 2013. Cardiovascular mortalities were five times higher than respiratory mortalities in the period of study. By contrast, the hospital admissions for respiratory and

cardiovascular diseases were approximately equal in the investigated time period. The total mortality attributed to exposure to PM2.5 was approximately equal to 45 deaths per year per 100 000 inhabitants which was higher than that attributed to exposure to PM10. Significantly lower values of total mortalities were obtained when examining the influence of NO 2 concentrations. Total mortalities were approximately equal to 10 deaths per year per 100 000 inhabitants for NO_2 exposure. The concentrations of NO_2 decreased during the period of studies. However, the concentrations of both PM10 and PM2.5 remain high. For this reason, air pollutants continue to have a significant influence on human health. The highest impact on total mortality was due to exposure to PM2.5 and the second highest was due to PM10. During the period between 2005 and 2013 the lowest impact on total mortality was due to NO 2 . Total mortality attributed to exposure to PM10 and PM2.5 is 4 to 5 times higher than total mortality attributed to exposure to NO 2 . Figure 1 shows the calculated health impact of PM10 exposure in the years 2006 and 2013. In the year 2006, the highest annual concentration of PM10 was observed and in the year 2013 the lowest annual concentration of PM10 was measured. Accordingly, the highest (2006) and the lowest (2013) number of cases attributed to exposure to air pollution were observed. Total mortality determinedfor 2006 was equal to 50 per 100 000 inhabitants and dropped to 30 in 2013. The number of cases for the year 2013 was almost two times lower than that for 2006. Cardiovascular mortality reached 50% of total mortality for both years. In contrast, respiratory mortality was only 10% of total mortality in both years. Cardiovascular mortality was comparable to hospital admissions due to cardiovascular diseases. However, hospital admissions caused by respiratory diseases were 13 times higher than respiratory mortality. It is worth mentioning that during the years 2009-2013 PM2.5 concentration dropped by 15.9% which was accompanied by a drop in total mortality attributed to PM2.5 of 12.8% in the city of Kraków. Similar calculations have shown that in Kraków, in the 2005-2013 time period, concentration of PM10 was lowered by 23% and attributable health effects dropped by about 26%. In the case of NO_2 in the same period of time a decrease in concentration of 4.8% was observed. Additionally, the total mortality attributed to exposure to NO_2 decreased by 6%.



Comparative results of the calculated health impact attributed to exposure to PM10 for the years 2006 and 2013.

The results obtained with the use of AirQ software for Kraków imply that exposure to polluted air can cause serious health problems. It would be beneficial to perform an analysis of epidemiological data for the city in comparison with the results presented in this manuscript to obtain more detailed insight on the impact of air pollution on human health. Results of this work were published in [5]. AKNOWLEDGEMENTS: The International Atomic Energy Agency, Technical Cooperation Project for Europe number RER/1/008, and the Polish Ministry of Science and Higher Education and its grants for Scientific Research no 11.11.220.01 partially financed this work.

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Titanium dioxide nanoparticles influence antioxidant status in plants

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Titanium dioxide (IV) nanoparticles (nano-TiO_2) are among the most manufactured metal nanoparticles with annual worldwide production above 10 000 metric tons (United States EPA, 2009). In Europe nano-TiO_2 concentrations reached 1.28 μg/kg/year in soil [1]. It is predicted that an appreciable amount of nano-TiO_2 will enter the food chain [2]. Mounting evidence has proved that nano-TiO_2 causes lipid peroxidation and promotes formation of reactive oxygen species (ROS) that induce cell and DNA damage [3]. It was also proved that plants grown in soil polluted with nano-TiO_2, absorb it and transport it to the organs [2]. The behavior of nano-TiO_2 is nowadays under scientific debate. Hence, toxicological studies have become extremely relevant.

Plants have evolved antioxidant defense systems to avoid the negative effects of ROS overproduction [4]. These responses include enzymatic and non-enzymatic antioxidants [5]. Among them, tocochromanols play the most important role.

We took advantage of Arabidopsis thaliana as a model species to analyze the effect of nano-TiO_2 on its antioxidant response. We analyzed the effect of a range of nano-TiO_2 concentrations (100 – 1000μg/ml) on growth, vitamin E content and the expression of its biosynthetic genes. To the best our knowledge, this is the first report concerning the effect of nano-TiO_2 on the vitamin E status in plants. To confirm that nanoparticle treated seeds absorb particles from the solutions we carried out an ICP-OES analysis. The leaves of A. thaliana had a Ti concentration ranging from 0.91 $\pm$ 0.1 to 1.54 $\pm$ 0.06 μg/g dry weight. Nano-TiO_2 treatments of seeds significantly reduced plant biomass even at the lowest tested concentrations (Table 1).

Nano-TiO_2 concentration [µg/ml]	Plant biomass [FW, g]
Control	2.10 ± 0.12
100	1.17 ± 0.16*
250	1.32 ± 0.50
500	0.74 ± 0.09
1000	0.95 ± 0.20**

Table 1. The effect of seed treatment by different concentrations of nano-TiO_2 on the biomass of 5-week-old Arabidopsis thaliana plants. FW – fresh weight. Data are means ± SE (n = 6). (*** = $P \leqslant 0.001$, ** = $P \leqslant 0.01$, * = $P \leqslant 0.05$).

The chlorophyll content was affected by nano-TiO_2 treatment and this phenomenon was concentration-dependent. Figure 1 shows tocochromanol content in the leaves of nano-treated plants. Under lower nano-TiO_2 concentrations the total tocochromanol content was slightly lower than in the control plants, whereas under 1000 μg/ml it reached the value measured for control plants (Fig. 1). The same trend was observed for α-tocopherol (Fig. 2, left, dashed bars). When we exposed those plants to high-light preceded by D_2O infiltration, we noticed an increase in the antioxidant level with increasing nano-TiO_2 concentrations (Fig. 2, right).

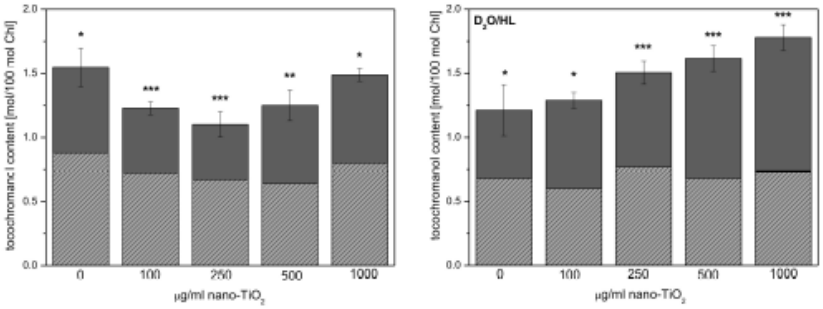

Figure 1. Total tocochromanols and α-tocopherol content in it (dashed bars) in Arabidopsis thaliana plants whose seeds were soaked with nano-TiO_2. Plants without illumination (left) and subjected to high light stress preceded by D_2O infiltration (right). Data are means ± SE (n = 5).

Nano-TiO_2 treatment influences the expression of all the tocochromanol biosynthetic genes (vte). Under lower and intermediate nano-TiO_2 treatment, all genes were down-regulated (Fig. 2) and the tocochromanol level was lower under the same concentrations (Fig. 1). In leaves of 1000 μg/ml nano-TiO_2-treated plants tocochromanol content reached the value observed for control plants (Fig. 2, left).

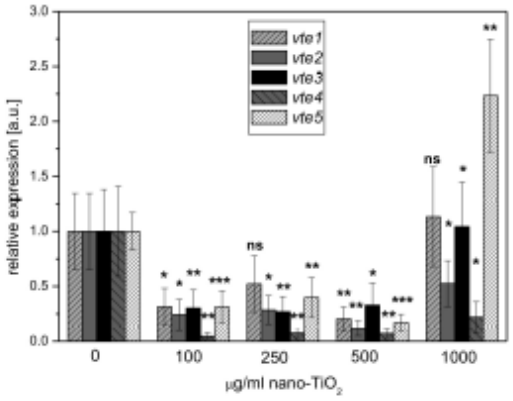

Figure 2. Relative expression level of vte genes in Arabidopsis thaliana leaves. Plant seeds were treated with different concentrations of nano-TiO_2. Data are means ± SE (n = 5).

We conclude that the presence of nano-TiO_2 in leaves causes a decrease in chlorophyll content and plant biomass. Nano-TiO_2 influences vitamin E content by the regulation of the expression level of its biosynthetic genes. Under lower tested nano-TiO_2 concentrations the vte genes were down-regulated, whereas under higher doses – up-regulated. Under HL conditions the presence of nano-TiO_2 resulted in an increase in tocochromanol content. This may be connected with nano-TiO_2 photoactivation and the enhancement of ROS production. It appears that higher nanoparticle concentrations cause membrane lipid peroxidation. Further studies are needed to uncover the behavior of a plants under environmentally relevant concentrations.

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Early and long-term elemental changes occurring in the rat liver after intravenous injection of iron oxide nanoparticles

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1. Background.

Although the number of research and practical applications of nanoparticles (NPs) in the biomedical field has rapidly expanded, potential toxicities of these novel materials are still very poorly known [1]. Investigations of NPs toxicity have been mostly carried out in vitro on cell cultures and thus their results do not reflect the behavior of these nanomaterials in more complex biological systems including living organisms [2]. Because among different nanomaterials, magnetic NPs have the greatest potential to revolutionize current clinical diagnostic and therapeutic techniques they were selected for the present study [3]. The main purpose of the investigation was determination of elemental changes occurring in the liver as a result of iron oxides nanoparticles (IONPs) injection.

2. Materials and methods.

The study was carried out on rats. At the 60th day of animals postnatal life they were divided into four groups. Three of them were intravenously injected with iron oxides (II, III) PEG functionalized NPs (Sigma Aldrich, 747408) dispersed in the mannitol solution (mannitol 10% solution for Infusion, Baxter). The hydrodynamic diameter and zeta potential of NPs were measured using DLS method at a wavelength of 633 nm and were estimated to be 35 nm and -98mV, respectively. The concentration of Fe in the solution was equal to 8 ppms. Taking into account the injected volume and animal body mass, the rats were exposed to the 1-2 orders of magnitude lower doses of NPs than doses used in clinical diagnostics, and significantly lower than those used in previous animal studies. The livers were taken from animals at the three different times (2, 24 hours and 7 days) passing from the injection of NPs what allowed to detect early and long-term changes in the accumulation of NPs as well as elemental anomalies occurring in the liver as a result of their action. Before elemental analysis the tissues were subjected to microwave-assisted digestion process in high purity nitric acid (100441/Suprapur® nitric acid 65%, density 1.39g/ml, Merck Group). The concentrations of Fe and other elements (mainly Ca, Cu, Zn and Se) in the liver were

measured using total reflection X-ray fluorescence (TXRF) spectrometry. Extremely high sensitivity and low detection limits offered through the technique allowed for the analysis of subtle changes in the accumulation of the elements under interest. All TXRF measurements were performed in the Laboratory of X-ray Methods (Jan Kochanowski University, Kielce) using S2 PICOFOXTM (Bruker Nano) automatic analytical instrument.

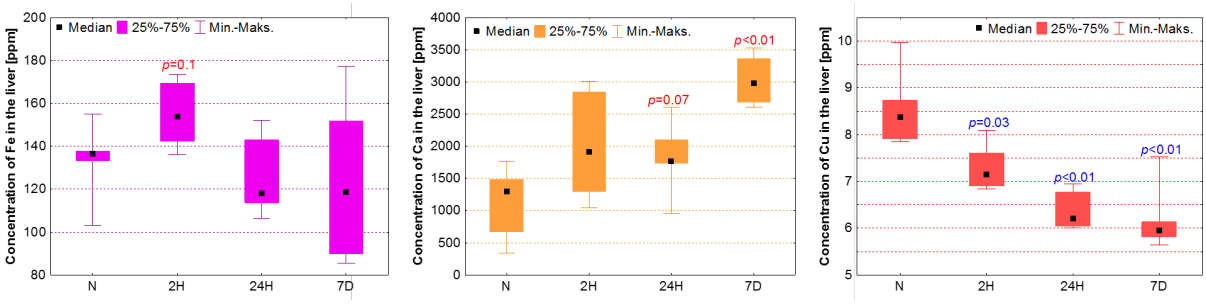

Figure 1. The comparison of median, minimal and maximal values of Fe, Ca and Cu concentrations in liver between animals treated with IONPs (2H, 24H and 7D groups) and controls (N). Statistically significant (comparing to control) changes in elemental concentration were followed by p-values of U test. Additionally, increases were marked in red, whilst decreases in blue.

3. Results.

The obtained results showed that the injection of animals with relatively low doses of IONPs led to significant changes in the concentrations of Fe, Ca and Cu within liver what one can see in the Figure 1. The concentration of Fe in the liver significantly increased 2 hours after injection of IONPs and 22 hours later reached the normal level. Despite this, seven days after exposure to NPs the level of Ca in the liver was still significantly higher comparing to controls. NPs-induced injury is usually connected with reactive oxygen species generation and subsequent oxidative stress [1,2]. In turn, one of the key pathophysiological outcomes of oxidative insults during metal NPs exposure is an alteration of calcium homeostasis [5]. The opposite relation was found for Cu. The concentration of this element significantly decreased in liver after IONPs administration. Such result is probably an effect of ceruloplasmine release from the liver to the plasma. Ceruloplasmin is glycoprotein synthetized in the liver hepatocytes that carries around 95% of the plasma Cu in mammals [3]. Its main activity is assumed to be that of ferroxidase [4] and, as a ferroxidase, ceruloplasmine participates in the regulation of Fe homeostasis through the catalysis of its oxidation from Fe2+ to Fe3+ [6,8]. The present investigation are continued. The next step of the study will be the analysis of elemental anomalies occurring in the other organs as a result of exposure to IONPs as well as comparison of early and long-term elemental changes after the treatment with the higher doses of NPs that are used in clinical diagnostics.

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Magnetic and dynamic properties of a sigma-phase $Fe_{66}V_{34}$ alloy

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1. Introduction.

Sigma (σ) phase belongs to the Frank-Kasper (FK) family of phases which are also designated as topologically close-packed (TCP) structures. Their characteristic features are high values (12-16) of coordination numbers. An interest in σ (and other FK-phases) is twofold: first, for practical reasons, and, second for scientific ones. The former stems from the detrimental effect of σ on many useful properties of technologically important materials e. g. steels, super alloys, and high entropy alloys. Its presence, even in low percentage, significantly deteriorates mechanical strength and resistance to high temperature corrosion. The scientific interest in σ is challenged by its complex crystallographic structure (tetragonal unit cell - space group D_{4h}^{14} - $P4_2/mnm$ - with 30 atoms residing on 5 non-equivalent lattice sites), and physical properties. They can be readily tailored by changing alloy elements and their chemical composition (σ can exists in a certain composition range). Magnetism of σ in the Fe-V system was revealed in early 1960s [1], and, until recently, regarded as ferromagnetism. Recently, its re-entrant character has been revealed [2]. The Fe-V system is especially interesting with regard to σ, as it can be formed within compositional range of $\simeq$ 33-65 at% V [3]. This gives a unique opportunity for studying the effect of composition on its physical properties. Here we report on magnetic and dynamical properties found in a $Fe_{60}V_{40}$ alloy using Mössbauer spectroscopy (MS), AC and DC magnetic susceptibilities techniques.

2.1. Magnetic ordering (Curie) temperature, T_C

It has been determined both from a temperature dependence of the average hyperfine field, $\langle B \rangle$, as well as from a temperature dependences of AC and DC susceptibilities. Corresponding measurements are shown in Fig 1. The former yielded T_C=312.4(5) K, while the latter gave 312(2) K.

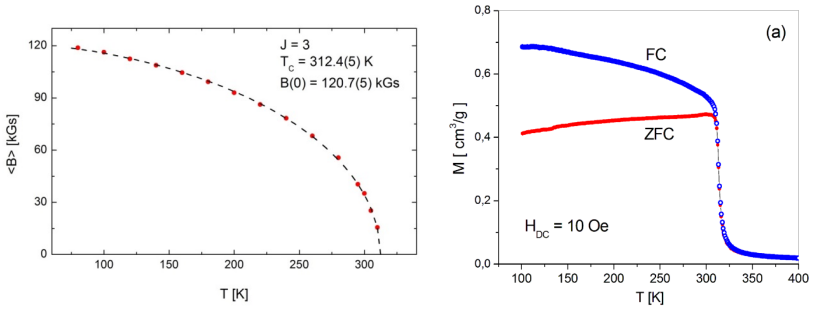

Figure 1. Temperature dependence of: (left) the average hyperfine field, $\langle B \rangle$, and (right) magnetization measured in zero-field cooling (ZFC) and in field cooling (FC) modes in an external field of 10 Oe.

2.2. Spin-glass behavior

A bifurcation effect observed in Fig. 1 testifies to irreversibility in the magnetic behavior, a feature characteristic, among other, of spin glasses (SGs). To shed more light on the issue AC magnetic susceptibility measurements vs. temperature and frequencies were carried out. Based on them various characteristics relevant to the SGs have been determined. In particular, a shift of the maximum in the AC susceptibility, T_f, with frequency, f, regarded as a hallmark of SGs was considered. The relevant figure of merit, $RST = \frac{\Delta T_f/T_f}{\Delta log f} = 0.002$, has a value characteristic of canonical SGs. Analysis of the data in terms of the Vogel-Fulcher law and the Tholence criterion support this finding [4].

2.3. Debye temperature, Θ_D

The value of Θ_D can be determined either from a temperature dependence of the center shift, CS, or from the recoil-free factor, f. The former is related to the average square velocity of vibrations, $< v^2 >$, hence the kinetic energy, E_K, while the latter to the average square amplitude of vibrations, $< x^2 >$, hence the potential energy (in the harmonic approximation), E_P. The values of Θ_D obtained with these approaches are 403(17)K and 374(2)K, respectively [5].

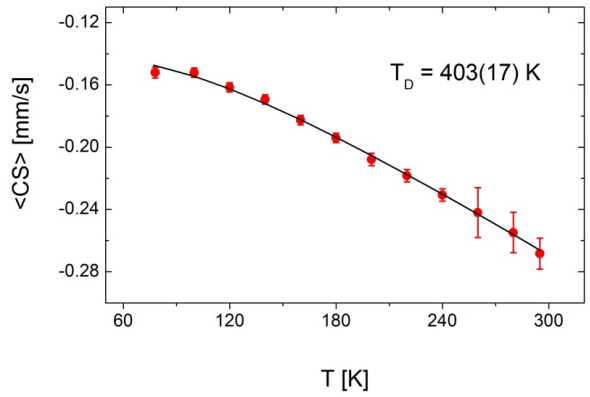

Figure 2. Temperature dependence of the average center shift, $\langle CS \rangle$. The solid line represents the best fit to the data in terms of the Debye model.

2.4 Force constant, D, and vibrational energy

Figure 3 gives evidence that $< v^2 >$ is linearly correlated with $< x^2 >$. The force constant, D, can be calculated based on this correlation. Namely, $D = m\alpha$, where α is the slope of the line in the $< v^2 > - < x^2 >$ relationship, and m is the mass of ^{57}Fe atoms. In this way D = 188(6) N/m was found. It compares well with the value of 157(2) N/m derived from the Fe-partial density of states measured at 298K for a σ-$Fe_{52.5}Cr_{47.5}$ alloy [6]. The obtained D-value can be next used to calculate a change of the potential energy, $\Delta E_p = 0.5D(< x^2 > - < x_o^2 >)$, in the studied temperature range as 18.8 meV. It agrees well with the corresponding change of the kinetic energy viz. 18 meV which proves that the lattice vibrations of Fe atoms in the studied alloy are harmonic within the accuracy of ±5%.

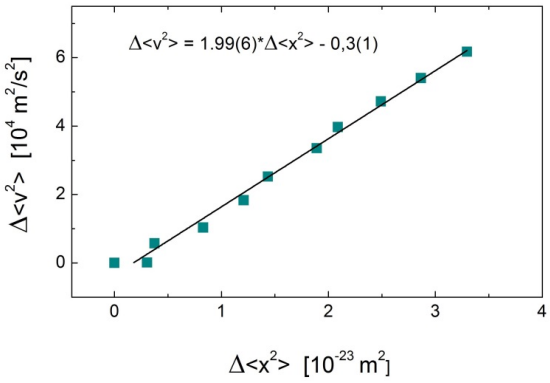

Figure 3. The mean-square velocity of the vibrating Fe atoms, $< v^2 >$, versus the mean-square amplitude of these vibrations, $< x^2 >$. The solid line represents the best linear fit to the data.

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SEARCH FOR OPTICAL METAMATERIALS A STOCHASTIC ALGORITHM

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Optical metamaterials are artificially generated structures specially engineered to interact with light. Their properties and the specifics of the way they interact with electromagnetic radiation are governed by their geometry rather than chemical composition. The characteristic length scale in such structures is generally comparable to the wavelength of e-m radiation. It is thus clear that in order to fabricate such materials one has to be able to build on the sub-micron scale. One of the techniques especially suited for fabrication of submicron three-dimensional structures is laser nanolithography, the advent of which allowed for the fabrication of a range of such materials working in the optical range and the near-IR, including photonic crystals [1], photonic quasicrystals [2], structures exhibiting asymmetric transmission [3] or disordered structures with a photonic bandgap [4-6].

Here we have utilized a simple stochastic algorithm to find an optical metamaterial acting as a half-wave or a quarter-wave plate, but in a broad frequency range in the near IR. Our design is based on a metallic plate containing 100 pixels located on a 10x10 square grid. The height of each pixel can range from 0 to 1.5 μm in discrete steps of 0.1 μm. Thus the structure resembles a city landscape of skyscrapers. The 10x10 grid is periodically repeated in both directions. Linearly polarized electromagnetic wave is incident in the direction perpendicular to the plate and is back-reflected by the metallic surface. However, as the height of each pixel may differ, the wavefront is modified and the polarization state of the reflected wave is strongly dependent on the pixel height distribution.

In order to determine the behavior of light reflected from the metamaterial surface we perform computer simulations based on the Finite Difference Time Domain (FDTD) technique, which consists in solving Maxwell's equations on a discrete grid in space and time. This way we measure the polarization state of a wave reflected from our structure.

Our algorithm starts with a completely random plate - each pixel height is randomly chosen from the set of allowed values. Then we simulate the interaction of light with the plate and record amplitude reflection coefficients and their relative phase shift. In the next stage the quality of the given metamaterial is assessed by means of a fitness function F, measuring how well the structure approximates the behavior of a quarter-wave or a half-wave plate. Next the plate undergoes random modification - each pixel's height is modified

with a certain probability by a maximum of 2 steps up or down and the fitness function is recalculated. If the modification leads to better properties (lower F value) it is conserved, otherwise it is rejected. The process is carried out step-wise until no further improvement is observed in reasonable time. Many different solutions are evolved in parallel in order to explore the vast parameter space (16^{100} solutions) more effectively.

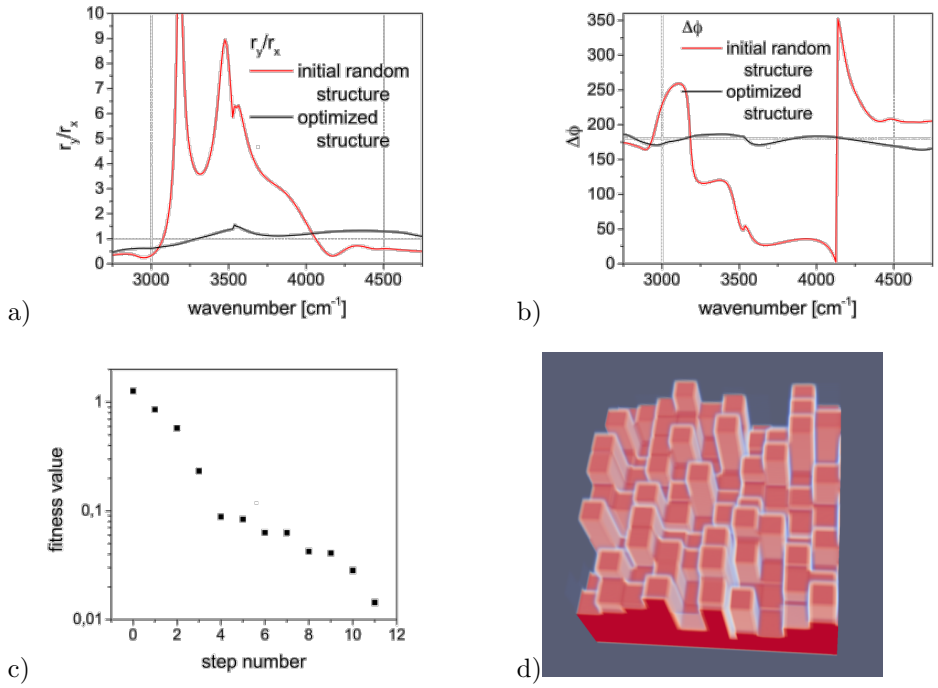

Figure 1. a) Amplitude reflection coefficient ratio for a random structure and the result of optimization, b) Relative phase shifts, c) Evolution of fitness values as a function of successful optimization step number, d) Geometry of the final metamaterial.

Fig. 1 presents one selected result of the optimization process, where we searched for a half-wave plate. Fig. 1a shows the ratio of amplitude reflection coefficients r_y/r_x, which should be equal to unity in a perfect structure. It is clear that while the initial random structure is far from perfect in the desired wavenumber range (3000 to 4500 cm^{-1}, red curve), the final metamaterial performs much better (black curve) - the ratio r_y/r_x is between 0.5 and 1.5 in the whole desired wavenumber range (except for one data point). Similarly (Fig. 2b), the relative phase shift in the initial structure is far from the designed value of 180°, but after optimization its mean value reaches 179° with the standard deviation of only 5 degrees.

In conclusion, we have shown that a simple stochastic algorithm is capable of finding an optical metamaterial with desired properties. Here we only show data for a half-wave plate, but we have also managed to find a structure acting as a quarter-wave plate. The same methodology, with a suitable fitness function, may be utilized to design other metamaterials, for instance twisting the polarization direction or modifying the polarization state in a different way.

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Transition from positive to negative magnetoresistance induced by a constriction in semiconductor nanowire

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The nanowires made of InSb are very interesting nanosystems for investigations of modern concepts in nanoelectronics, and spintronics in particular. For example, in the presence of the magnetic field, the phase coherent transport is observed in InSb nanowires at low temperatures [1], and the quantization of the conductance in the nanosystems has been experimentally confirmed more recently [2].

We have studied [3] the influence of the spin degree of freedom on the magnetotransport properties of the three-dimensional InSb nanowire with a constriction placed at the half-length of the nanowire, and in the presence of the magnetic field directed along the axis of the nanowire. Utilization of the magnetoresistance effect in the nanowires, which can possibly replace devices of larger extents, may be seen as an opportunity to enable high sensitivity, while the small power consumption is ensured. Recent studies on nonmagnetic III–V nanowires suggest such possibility for future high-density magneto-electric devices, compatible with commercial silicon technology [4]. The available experimental reports show that the change of MR sign can be related to the applied gate voltage in a number of different materials, including organic semiconductors [5] and carbon nanotubes [6]. Our calculations show that this effect can be also induced by the presence of the constriction in the nanowire.

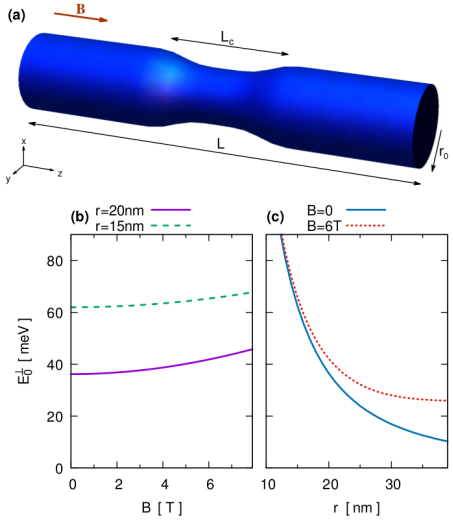

Figure 1. (a) Schematic of the nanowire with a single constriction. (b) Dependence of the transverse eigenenergy on the magnetic field at two distinct z-coordinates, at which the radius of the nanowire is equal to 20 nm (solid lines) or 15 nm (dashed lines). (c) Same as (b), but as a function of the radius of the cross-section.

The assumed model allowed us to consider the InSb nanowire grown in [111] direction (z-axis), and with a constriction in the middle of its length, as presented schematically in Fig. 1(a). Within the effective mass approximation, the Hamiltonian used for the calculations

included terms resulting from the confinement potential energy, electric field applied between the contacts and the magnetic field along the axis of the nanowire. In the limit of low electric fields, the change of the potential profile as well as the spin-orbit Rashba term can be neglected. However, we include in our calculations the effect of the intrinsic spin–orbit interaction which stems from the band structure by an appropriate renormalization of the electron Landé factor according to the second-order of the k·p perturbation theory [7].

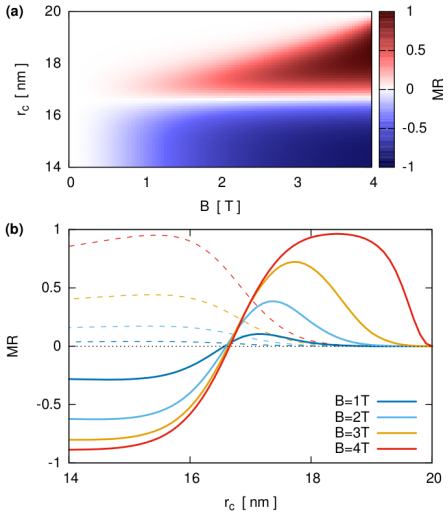

Figure 2. Magnetoresistance as a function of: (a) radius of the constriction and magnetic field and (b) radius of the constriction (cross sections of (a) at different magnetic fields; dashed lines correspond to the results obtained when spin of the electrons is neglected).

The results have been obtained within the three-dimensional model of the nanowire using the adiabatic approximation [8], with the transverse states calculated by the variational method. The associated z-dependent transverse-state energies create the effective-potential barriers and modify the Landé factor, making it the position- and magnetic-field dependent quantity. The effective g-factor is a monotonically decreasing function of the nanowire radius, and the effect of the magnetic field on the effective g-factor is negligibly small in the constriction region for the lowest-energy transverse mode. Using the two-current Mott model, we have investigated the influence of the constriction radius and the magnetic field on the spin conductance in the coherent regime of the transport. We have shown that the sign of magnetoresistance can be reverted by changing the radius of the constriction, which strongly affects the transverse states. On the contrary, the increase of the magnetic field while the radius of the constriction is kept constant leads to the increase of the magnetoresistance but does not change its sign. We have explained the positive/negative magnetoresistance transition as a combined result of the squeezing of the transverse electron states in the region of the constriction and the spin Zeeman splitting.

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Generation of longitudinal electron's oscillations in bilayer nanowire by picosecond magnetic pulse

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In nanostructures, which include two vertically or laterally aligned quantum wires, the electron transport properties are largely influenced by a tunnel coupling between transport channels. Magnitude of this type of coupling can be easily modified by magnetic field which may enhance as well as diminish it what obviously depends on the strength of magnetic field but also on mutual arrangement of magnetic field, direction of tunnel coupling and the axis of nanowire [1,2] If a direction of stationary magnetic field is perpendicular to the wire's axis but parallel to the coupled layers, the electron's wave functions originated from different layers are hybridized what results in opening of small pseudogaps in energy spectrum $E(k)$ [3,4,5]. In 2013 year it was demonstrated that the magnetic field of amplitude of half Tesla can be created within the time interval less than one picosecond [6]. That gives possibility for investigation of dynamical effects of magnetic hybridization in bilayer nanostructures.

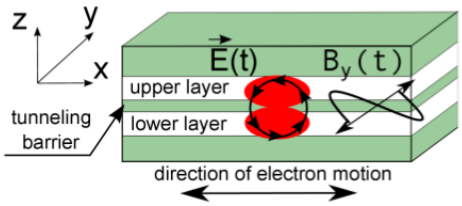

Figure 1. Cross-section of a bilayer nanowire. Magnetic pulse $\vec{B} = (0, B_y(t), 0)$ induces a rotational electric field $\vec{E}(t)$ in which tries to push the electron densities localized in upper and in lower layers in opposite directions.

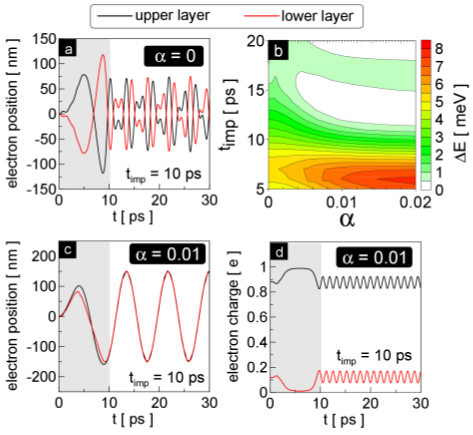

Figure 2. Expectation value of electron's position [(a) and (c)], interlayer charge oscillations (d) and the energy delivered to the system by the magnetic pulse (b) for a bilayer nanowire made of $GaAs$.

Here we study this problem theoretically for a 800-nm-long nanowire consisting of two vertically coupled transport channels made of GaAs [7]. Cross section of considered nanostructure is shown in Fig. 1. The confinig potential in vertical direction is approximated

by formula $V_c(z) = V_{max}\{\sin[(1+z/b)\pi/2] + \alpha \sin[\pi(1+z/b)]\}$, where $V_{max} = 100\text{meV}$ is the amplitude of central tunneling barrier, $2b = 30\,\text{nm}$ is the width of quantum well in which the upper and lower transport layers are localized, while α is the parameter of the confining potential's asymmetry. Nanowire confines only one electron which is initially localized in its center due to parabolic confinement of strength $\hbar\omega_0 = 1\,\text{meV}$ established in x direction. Due to weak coupling of vertical (z-axis) and longitudinal (x-axis) degrees of freedom, the electron's wave function can be approximated as linear combination of time-dependent solutions for x direction and stationary solutions for vertical one, that is, $\Psi(x,z,t) = \sum_{k=1}^{M} \varphi(x,t) \cdot f_k(z)$.

For a vector potential $\vec{A} = [-zB_y(t), 0, 0]$, the matrix elements of single electron's Hamiltonian have the following form

$$\begin{aligned} \widehat{H}_{k,k'} &= \left(\frac{\widehat{p}_x^2}{2\,m^*} + V_c(x) + E_k^{(z)}\right)\delta_{k,k'} \\ &\quad + \omega_c \langle f_k|z|f_{k'}\rangle \widehat{p}_x + \frac{m^*\omega_c^2}{2}\langle f_k|z^2|f_{k'}\rangle, \end{aligned} \tag{1}$$

where E_k is an energy of f_k eigenstate, $\omega_c = eB_y/m^*$ is a cyclotron frequency, $m^* = 0.067$ is a conductance band effective mass while $\widehat{p}_x$ is momentum operator of electron. When the time-varying magnetic field (magnetic pulse) piercies the wire, the off-diagonal elements which are linear with $\widehat{p}_x$ may change the electron's momentum. The classical countepart of this effect is the Faraday's law ($\nabla \times \vec{E} = -\partial_t = \vec{B}$). The rotational electric field induced in upper and lower transport layers pushes the electron densities localized in these layers in opposite directions what is schematically depicted in Fig.1. When the confinement in vertical direction is symmetric ($\alpha = 0$) the upper and lower parts of charge density moves along the wire's axis in anti-phase [Fig.2(a)]. If this symmetry is broken ($\alpha > 0$) then the majority of charge density localized in upper layer drags the minor one (lower layer) in the same direction what results in their synchroneous motion [Fig.2(c)] along the wire with small oscillations of charge between layers [Fig.2(d)]. Interaction of electron with magnetic pulse means that some amount of energy delivered to the system is transformed into motion energy. Efficiency of this process depends on asymmetry of the confining potential as well as on duration time of magnetic pulse what shows Fig.2(b).

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Measurement of diffractive and exclusive processes with forward proton tagging in proton-proton collisions at the LHC in the ATLAS experiment

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The total cross section in hadronic scattering experiments is traditionally broken into elastic ($pp \to pp$), single-diffractive dissociation ($pp \to Xp$), double-diffractive dissociation ($pp \to XY$) and non-diffractive contributions. Diffractive processes are predicted to occur in about of 30% of collisions at LHC energies, with a large theoretical uncertainty. The inelastic cross section is dominated by non-perturbative processes and therefore cannot be reliably predicted from first principles in QCD. The total cross section characterizes a fundamental process of the strong interaction. Its energy dependence has been studied at each new range of available energies.

Based on a data sample of proton-proton collisions collected at 8 TeV in 2012, the ATLAS Collaboration measured elastic and total cross sections[1]. The elastic scattering data were recorded with ALFA sub-detector (Absolute Luminosity for ATLAS)[2]. It consists of Roman Pot tracking detector stations placed at distance of 237 m and 241 m on either side of the ATLAS interaction point. Fig. 1 shows comparison of total and elastic cross-section measurements performed by ATLAS with other published measurements. The measurements at 8 TeV are significantly more precise than previous measurements.

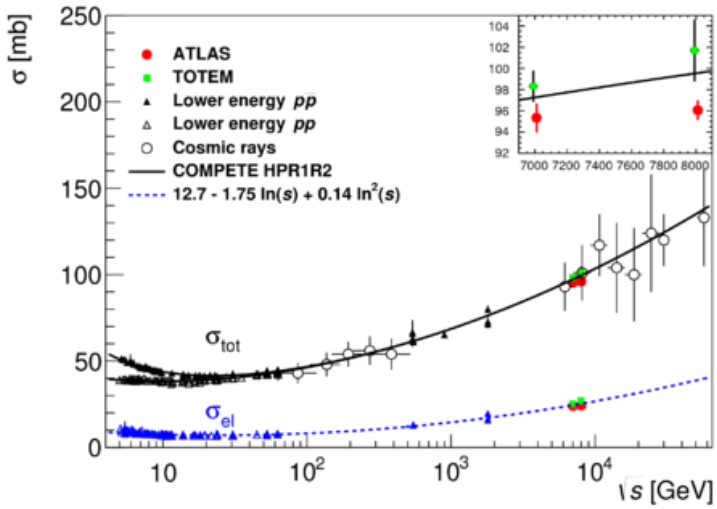

Figure 1. Comparison of total and elastic cross-section measurements performed by the ATLAS experiment with other published measurements.

The ATLAS AGH group played significant role in extension of the ALFA physics program at 8 TeV to diffractive measurements. In 2016 the analysis of inclusive single-diffractive dissociation ($pp \to Xp$) and exclusive central production of pion pairs ($pp \to p\pi\pi p$) showed significant progress. In parallel preliminary studies of the data collected in 2015 at 13 TeV were performed. Significantly larger data sample collected in 2015 will allow partial wave analysis of the centrally produced low mass diffractive states in the region of hypothetical bound state of gluons (glueballs).The prediction that glueballs exist is one of the most important predictions of the Standard Model of particle physics that has not yet been confirmed experimentally.

All experiments at the LHC are searching for a sign of "new physics", i.e. particles that do not fit in Standard Model and are heralds of a more fundamental underlying theory. One of the possible tools to search for unexpected is the study of the photon-photon interactions. The photons interact via the very well-established rules of the Standard Model and are very well predicted. At very high energy many corrections are required in the calculations, in particular corrections from contributions of hereto unknown particles. In proton-proton interaction such rare events can be caused by the emission of two energetic photons, one from each interacting proton. If the process is exclusive the two photon system is completely determined by the properties of the two forward protons.

The properties of the central system produced in the photon-photon interaction must precisely match the properties predicted from the forward protons. This match provide additional selection criterion on such events and rejects backgrounds from other processes. At high luminosity forward proton tagging is not enough to select protons coming from interaction of interest out of protons coming from other usually soft pile-up interactions. For many years forward physics community at the LHC has developed an idea to measure precisely also the time of arrival of the protons in the forward detectors, and thus know if the protons come from the vertex of interest. For such purposes ATLAS propose to build[2] new radiation hard forward proton (AFP) detectors consisting of a silicon 3D pixel tracker and quartic time of flight detectors.

In 2016 two AFP detectors at 205 m and 214 m from ATLAS interaction point were installed. They will be complemented in 2017 by two more AFP detectors on the other side of ATLAS. Fig. 2 shows simulated x-y track position hit map of the diffractive protons and raw pixel hit map from data taken during the LHC intensity ramp-up step on 10th of May 2016[3].

The AFP installation was the culmination of the intense program of detector construction and the starting point of even more intense phase of physics analysis of the collected and future data. The ATLAS AGH group is important part of this program contributing to the development of the AFP detector simulation, reconstruction of the forward proton kinematics and building software environment for data preparation for physics analysis. The ATLAS AGH group provides direct financial support for AFP detector construction under the grant from National Science Centre [4].

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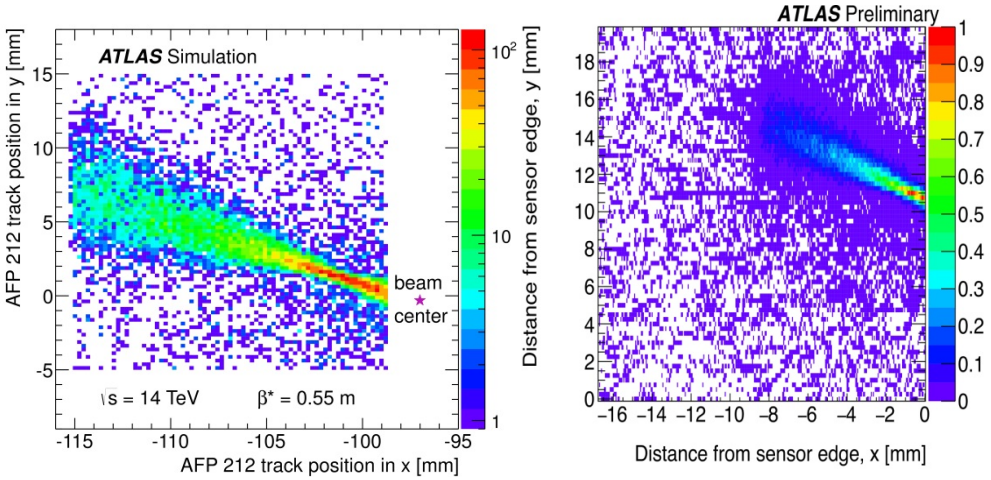

Figure 2. (Left) Simulated x-y track positions hit map for outer (AFP 212) station. Positions are calculated in the ATLAS Coordinate System[3]. (Right) Number of raw unclustered pixel hits in arbitrary units of a tracker plane in the Near Station (205 m from the ATLAS interaction point). Distances are in the local reference frame of the plane. The data was taken during the 300 bunches LHC intensity ramp-up step (10th of May 2016) . The diagonal line corresponds to the detected diffractive protons.).

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Contribution to design and construction of the Upstream Tracker detector for the LHCb upgrade

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The AGH-LHCb group has started to significantly contribute to the construction of the UT [1] (Upstream Tracker) detector in 2014. The group is solely responsible for the design of the novel front-end readout electronic ASIC (Application Specific Integrated Circuit) for silicon micro-strip detectors for the modernised LHCb spectrometer. The chip, called SALT (Silicon ASIC for LHCb Tracking), is able to read the analogue signal generated within the silicon bulk within 25 ns (which corresponds to the LHC machine clock), digitise it with 6 bit resolution, perform involved digital processing and zero-suppression as well as re-format and serialise the output data and send the for further processing to the High Level Trigger system [2]. The upgraded LHCb detector will feature a truly revolutionary trigger system, which will be fully implemented in software [3] and run in the powerful computing cluster consisting of approximately 50 000 logical CPU cores. The SALT chip is a critical part of this new readout scheme.

The main achievement of this ongoing design process is production of a novel fully-fledged SoC (System on Chip) that feature a very complicated architecture providing unique functionalities necessary for coping with detection system foreseen for the upgraded LHCb detector. These requirements concerning: large number of readout channels per ASIC, finer channel segmentation matched to sensor pitch, faster signal processing, lower power consumption per channel, lower noise, better radiation hardness, on-chip implementation of analog-to-digital (ADC) conversion, DSP – digital signal processing (e.g. baseline subtraction, common-mode subtraction, zero suppression), slow control interfaces (e.g. I^2C – Inter Integrated Circuit protocol), fast serial data transmission as well as implementation of power pulsing and other specific features that allows to compress the UT detector data output that amounts to approximately 240 Mb/s. Without the SALT chip the data taking with the upgraded LHCb detector will not be possible.

The fact that AGH-LHCb group is completely responsible for such vital part of the new detector shows the trust bestowed by the LHCb Collaboration in the designing team from Kraków. Presently, the design phase has been finished and a full 128-channel prototype has been produced and is being tested and integrated into the UT detector infrastructure. The preliminary results confirmed major chip's functionalities [4].

The AGH-LHCb group take very active part in test beam experiments where prototype sensors and readout blocks are being tested [5]. These studies are using the CERN SPS

(Super Proton Synchrotron) proton beams to produce secondary particles (mainly pions). The main tasks assigned to the AGH-LHCb group are: SALT chip emulation software (including full digital data processing chain), data analysis and detector shifts during data taking. The analyses performed by the team members include spatial resolution measurements as a function of the track angle and the radiation dose. These studies are quite involve and time consuming, since apart from particle position reconstructed by the UT tested device also a high quality tracks are required. These tracks are reconstructed by the dedicated pixel telescope capable of performing stand-alone charged particle tracking. The synchronisation procedure to match the reconstructed hit and the corresponding track is complex. Test beam data analysis is a critical part of the design process and is used for debugging the constructed detector.

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Partitioning of CO_2 sources in an urban area

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Numerous studies report elevated atmospheric CO_2 concentrations in urban areas due to presence of anthropogenic sources that increase local atmospheric CO_2 load and change its isotopic composition (e.g. [1,2]). These anthropogenic sources of CO2 are of three main categories: industrial, residential and traffic. The CO_2 which is being emitted by those sources has distinct carbon isotope signatures (δ^{13}C and δ^{14}C values). The isotopic composition of atmospheric CO2 in an urban area is also influenced by biogenic sources which isotopic signatures can be shifted due to assimilation of local, ^{12}C-enriched CO_2 [3]. High-frequency measurements of atmospheric CO_2 mixing ratios and their δ^{13}C isotope signatures have been performed in Kraków, Poland from 2011 to 2014.

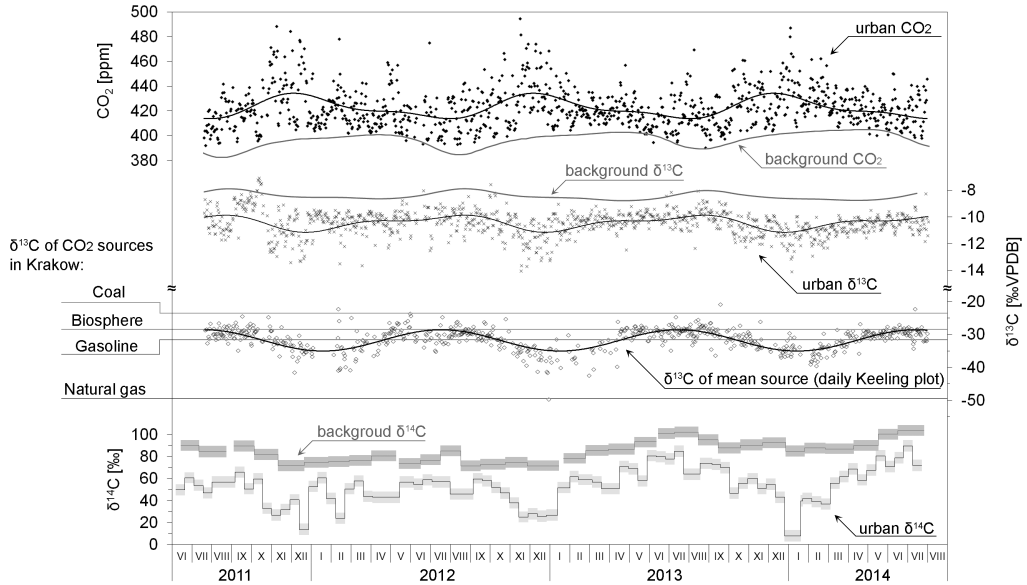

Figure 1. Top to bottom: (i) daily means of atmospheric CO2 mixing ratios measured in Kraków during the period June 2011 - July 2014 (black dots) and regional background CO2 level [5]; (ii) daily means of $\delta^{13}CO_2$ in Kraków atmosphere and of local mean CO_2 source, calculated using Keeling approach. δ^{13}C isotope signatures of major categories of CO_2 sources in Kraków (coal, gasoline, natural gas, biosphere) are also indicated [2,3]; (iii) bi-weekly means of radiocarbon content in atmospheric CO_2 in Kraków and Kasprowy Wierch station.

Picarro G2101i analyzer based on absorption of laser light in near-infrared region has

been used for this purpose. The mean $\delta^{13}C$ signature of the CO_2 source was calculated on daily basis using Keeling approach (e.g. [3]). Atmospheric $^{14}CO_2$ measurements were conducted in Kraków and at Kasprowy Wierch regional baseline station on cumulative, bi-weekly samples. Regional background CO_2 mixing ratios were obtained from NOAA database [4]. The resulting data records are presented in Fig.1.

On average, the CO_2 mixing ratio measured in Kraków was 26.5±1.8 ppm higher than the regional background, with slight decreasing trend between 2011 and 2014. On monthly basis, this difference was higher during winter (up to 45 ppm) and lower during summer (ca. 10 ppm).

The CO_2 mixing ratio in Kraków, averaged over the observation period (2011-2014) was 422.5± 1.5 ppm, to be compared to 396.0 ± 1.0 ppm of the local baseline concentration of this gas. Average CO_2 excess in the local atmosphere (26.5± 1.8 ppm) was due to local emissions of carbon dioxide from the surface. Radiocarbon mass balance for atmospheric CO_2 in Kraków has been employed on annual and monthly basis to calculate the load of fossil fuel derived CO2 in the local atmosphere [5]. The fossil fuel derived CO_2 load averaged over the observation period was 12.7±0.8 ppm, with the seasonal variability in the range of 5-25 ppm. The remaining 13.7±1.1 ppm represents local net biogenic input. Seasonal variability of CO_2 mixing ratio in Kraków atmosphere is controlled by seasonality of the sources, rather than natural biospheric cycle. During cold season, high loads of fossil fuel derived CO_2 were present because of increased fuel consumption (Fig. 2).

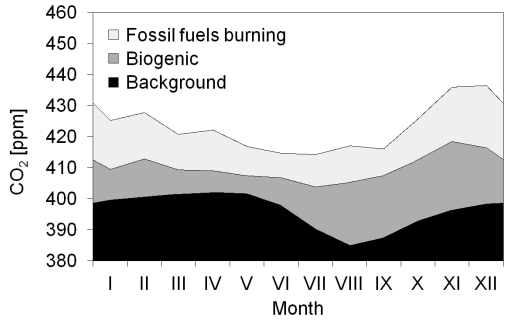

Figure 2. Mean seasonal variations of CO_2 mixing ratio in Kraków atmosphere during the period 2011-2014, separated into local background [4], biogenic, and fossil fuel derived components.

During warm season, biospheric emissions were more pronounced. Biogenic CO_2 load in the urban atmosphere was changing from approximately 6 ppm during spring time to 24 ppm during autumn. On regional scale, the photosynthetic uptake of CO_2 is certainly a dominating process during summer but at the local scale (urban environment) the respiration prevails. Main fuel types that are being consumed by Kraków agglomeration (coal, gasoline and natural gas) have distinct $\delta^{13}C$ signatures (cf. Fig.1; [2]). This information was used to separate the fossil fuel load into contributions coming from these three sources. The 13C mass balance based on average values for the entire observation period (2011-2014) was employed for this puropose. On average, 27 ppm of CO_2were emitted annually by the local sources to the Kraków atmosphere. Of that, 52 % was emitted by biosphere, 18% came from natural gas burning, 16% from coal burning, and the remaining 14% was emitted by traffic.

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Carbon isotope composition of total suspended particulate matter in urban atmosphere of Krakow, southern Poland: summer - winter contrast

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Deterioration of air quality in urban centres is a growing problem of global significance [1]. This spurs research towards better understanding of parameters controlling air quality in urban environment, such as the sources of particulate matter and gaseous contaminants, spatial and temporal variability of air quality, impact of atmospheric dynamics on the air quality, and some others. Krakow belongs to four largest cities in Poland. With nearly one million inhabitants, rapidly growing car traffic and significant industrial activities, Krakow agglomeration is representative for a typical urban environment in eastern Europe. Characteristic features of the local climate are generally weak winds (annual average around 2.7 m/s) and frequent inversions, extending sometimes over several days, particularly during winter seasons, favor accumulation of pollutants originating from surface emissions in the atmosphere over the city. Krakow ranks among the most polluted cities in Europe. There is an ongoing discussion on the impact of different sources of total suspended particulate matter (TSPM) on the quality of city's atmosphere, such as traffic, low- and high-level emissions related to burning of coal for heating purposes, resuspension of street dust, and some others. The presented work was aimed at exploring possibilities of using carbon isotope composition of total particulate matter collected in Krakow atmosphere for a better characterization of TSPM sources in the city, with the focus on seasonal changes of the character and strength of those sources. Archived samples of TSPM deposited on quartz filters were used for this purpose (Fig. 1). The sampling interval for each filter was between five and twenty days. The analyzed filters cover the period from 2005 to 2010 [2]. For each year one pair of filters representing summer and winter season was selected.

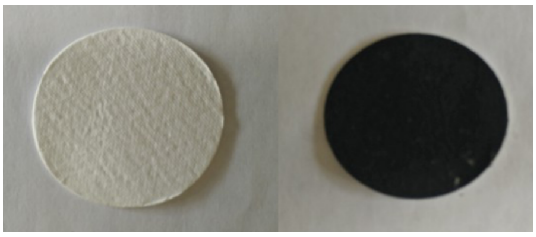

Figure 1. Example of total suspended particulate matter deposited on quartz filter over the period of 2 weeks during winter season in Krakow [3].

The mean values of the measured parameters for each filter (percentage of total carbon on the filter, ^{13}C and ^{14}C content in the total carbon) revealed large seasonal contrast (Table 1). During winter, the total carbon accounted for approximately 50% of TSPM mass collected

Period	Carbon content (%)	δ^{13}C (%)	ppF (%)
Winter	52.7 ± 4.1	-24.8 ± 0.2	66.2 ± 2.8
Summer	37.9 ± 2.4	-26.9 ± 0.3	38.1 ± 2.8

Table 1. Mean values of the parameters measured for TSPM collected on filters during summer and winter (2005-2011 period).

on the filter. During summer, total carbon content dropped to ca. 38%. Large summer-winter contrast in fossil-fuel carbon fraction (pFF) derived from AMS radiocarbon analyses was found, with significant year-to-year fluctuations (Table1, Fig. 2). The mean pFF value over the period 2005-2010 was 66.2 and 38.1%, for winter and summer samples, respectively. Slight decreasing trend of pFF values for winter samples was observed (Fig.2), which could be related to reduced input of TSPM from low-level emissions related to burning of coal for heating purposes. Table 1. Mean values of the parameters measured for TSPM collected on filters during summer and winter (2005-2011 period).

A strong positive correlation was found between $^{\delta}$13C and pFF, suggesting intensified burning of coal as the main source of fossil fuel-derived carbon during winter in the city (Fig. 3).

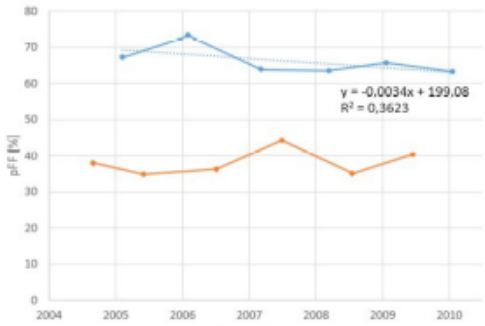

Figure 2. Variations of fossil-fuel fraction (pFF) of the total carbon present in the analysed samples of TSPM (blue - winter; orange - summer).

Polish coals have pFF value of 100% and δ^{13}C in the range from -23.5 to -24.5%. Thus, intensified burning of fossil fuels during winter may lead to the observed elevated δ^{13}C values during this time of the year. Carbon particles may also originate from exhaust of diesel engines. Diesel fuel has δ^{13}C around -29%. As the contribution of this source is roughly uniform throughout a year, it may influence the observed relationship between δ^{13}C and pFF only marginally. Intensified burning of fossil fuels during winter was also reflected in larger percentage of fossil carbon in gaseous CO_2 present in the city atmosphere (ffCO_2) during winter (Fig.4).

Radiocarbon content in atmospheric CO2 in Krakow was measured in bi-weekly cumulative samples of CO_2 extracted from air and analyzed using benzene synthesis and liquid scintillation spectrometry [4]. The linear relationship observed between pFF and ffCO_2 (Fig. 4), when extrapolated to the ffCO_2 value equal zero, gives the pFF value of ca. 30%. This suggests that there are additional sources of fossil carbon in TSPM when compared to at-

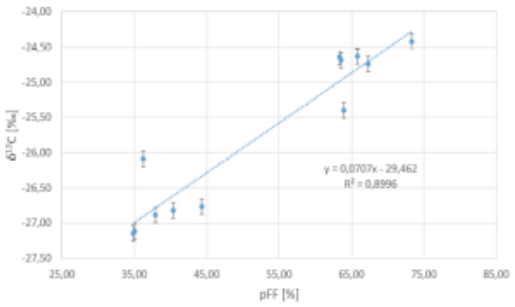

Figure 3. Relationship between $\delta^{13}C$ and pFF in the total carbon present in the analysed samples of TSPM deposited on filters.

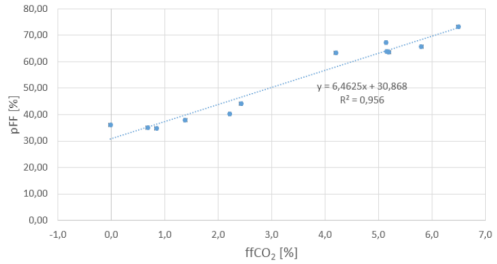

Figure 4. Relationship between fossil-fuel fraction (pFF) in the total carbon present in the analysed samples of TSPM and the percentage of fossil carbon ($ffCO_2$) present in the city atmosphere in the form of gaseous CO_2.

mospheric CO_2 reservoir. Most probably, the main source of this carbon is wearing of car tires and asphalt.

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283. Search for a high-mass Higgs boson decaying to a W boson pair in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The Journal of High Energy Physics 2016 iss. 1 art. no. 032.

284. Search for a narrow baryonic state decaying to pK^0_S and $\bar{p}K^0_S$ in deep inelastic scattering at HERA.
H. Abramowicz, [et al.], L. ADAMCZYK, [et al.], G. GACH, [et al.], M. GUZIK, [et al.], D. KISIELEWSKA, [et al.], M. PRZYBYCIEŃ, [et al.].
Physics Letters. B 2016 vol. 759, s. 446–453.

285. Search for B^+_c decays to the $p\bar{p}\pi^+$ final state.
R. Aaij, [et al.], M. FIRLEJ, [et al.], T. FIUTOWSKI, [et al.], M. IDZIK, [et al.], W. KUCEWICZ, [et al.], P. MORAWSKI, [et al.], J. MOROŃ, [et al.], A. OBŁĄKOWSKA-MUCHA, [et al.], K. ŚWIENTEK, [et al.], T. SZUMLAK, [et al.].
Physics Letters. B 2016 vol. 759, s. 313–321.

286. Search for bottom squark pair production in proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI,

[et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The European Physical Journal. C, Particles and Fields 2016 vol. 76 iss. 10 art. no. 547.

287. Search for charged Higgs bosons in the $H^{\pm} \rightarrow tb$ decay channel in pp collisions at $\sqrt{s} = 8TeV$ using the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. Gach, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The Journal of High Energy Physics 2016 iss. 3 art. no. 127.

288. Search for charged Higgs bosons produced in association with a top quark and decaying via $H^{\pm} \rightarrow \tau\upsilon$ using pp collision data recorded at $\sqrt{s} = 13$ TeV by the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters. B 2016 vol. 759, s. 555–574.

289. Search for dark matter produced in association with a hadronically decaying vector boson in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters. B 2016 vol. 763, s. 251–268.

290. Search for dark matter produced in association with a Higgs boson decaying to two botton quarks in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
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291. Search for direct top squark pair production in final states with two tau leptons in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The European Physical Journal. C, Particles and Fields 2016 vol. 76 iss. 2 art. no. 81.

292. Search for flavour-changing neutral current top-quark decays to q Z in pp collision data collected with the ATLAS detector at $\sqrt{s} = 8$ TeV.

G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The European Physical Journal. C, Particles and Fields 2016 vol. 76 iss. 1 art. no. 12.

293. Search for gluinos in events with an isolated lepton, jets and missing transverse momentum at $\sqrt{s} = 13$ TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The European Physical Journal. C, Particles and Fields 2016 vol. 76 iss. 10 art. no. 565.

294. Search for heavy long-lived charged R-hadrons with the ATLAS detector in 3.2 fb^{-1} of proton-proton collision data at $\sqrt{s} = 13$ TeV.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters. B 2016 vol. 760, s. 647–665.

295. Search for Higgs-like bosons decaying into long-lived exotic particles.
R. Aaij, [et al.], M. FIRLEJ, [et al.], T. FIUTOWSKI, [et al.], M. IDZIK, [et al.], W. KUCEWICZ, [et al.], P. MORAWSKI, [et al.], J. MORONŃ, [et al.], A. OBŁĄKOWSKA-MUCHA, [et al.], K. ŚWIENTEK, [et al.], T. SZUMLAK, [et al.].
The European Physical Journal. C, Particles and Fields 2016 vol. 76 iss. 12 art. no. 664.

296. Search for Higgs and Z Boson Decays to $\phi\gamma$ with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physical Review Letters 2016 vol. 117 iss. 11, art. no. 111802.

297. Search for high-mass new phenomena in the dilepton final state using proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters. B 2016 vol. 761, s. 372–392.

298. Search for invisible decays of a Higgs boson using vector-boson fusion in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.],

D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The Journal of High Energy Physics 2016 iss. 1 art. no. 172, s., 1–43.

299. Search for magnetic monopoles and stable particles with high electric charges in 8 TeV pp collisions with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physical Review D 2016 vol. 93 iss. 5 art. no. 052009.

300. Search for metastable heavy charged particles with large ionization energy loss in pp collisions at $\sqrt{s} = 13$ TeV using the ATLAS experiment.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physical Review D 2016 vol. 93 iss. 11, art. no. 112015.

301. Search for minimal supersymmetric standard model Higgs bosons H/A and for a Z' boson in the $\tau\tau$ final state produced in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The European Physical Journal C 2016 vol. 76 iss. 11 art. no. 585.

302. Search for new phenomena in different-flavour high-mass dilepton final states in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The European Physical Journal C 2016 vol. 76 iss. 10 art. no. 541.

303. Search for new phenomena in dijet mass and angular distributions from pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters. B 2016 vol. 754, s. 302–322.

304. Search for new phenomena in events with at least three photons collected in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector.

G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The European Physical Journal C 2016 vol. 76 iss. 4, art. no. 210.

305. Search for new phenomena in events with a photon and missing transverse momentum in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The Journal of High Energy Physics 2016 iss. 6, art. no. 059.

306. Search for new phenomena in final states with an energetic jet and large missing transverse momentum in pp collisions at $\sqrt{s} = 13$ TeV using the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physical Review D 2016 vol. 94 iss. 3, art. no. 032005.

307. Search for new phenomena in final states with large jet multiplicities and missing transverse momentum with ATLAS using $\sqrt{s} = 13$ TeV proton-proton collisions.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters B 2016 vol. 757, s. 334–355.

308. Search for new phenomena with photon+jet events in proton-proton collisions at $\sqrt{S} =$ 13 TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The Journal of High Energy Physics 2016 iss. 3 art. no. 041.

309. Search for new resonances in events with one lepton and missing transverse momentum in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters B 2016 vol. 762, s. 334–352.

310. Search for pair production of gluinos decaying via stop and sbottom in events with

b-jets and large missing transverse momentum in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physical Review D 2016 vol. 94 iss. 3, art. no. 032003.

311. Search for pair production of Higgs bosons in the $b\bar{b}b\bar{b}$ final state using proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physical Review. D 2016 vol. 94 iss. 5, art. no. 052002.

312. Search for production of single vector-like and excited quarks in the W t final state in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. Gach, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The Journal of High Energy Physics 2016 iss. 2 art. no. 110.

313. Search for resonances in diphoton events at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. Dyndał, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
The Journal of High Energy Physics 2016 iss. 9 art. no. 001.

314. Search for resonances in the mass distribution of jet pairs with one or two jets identified as b-jets in proton-proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters B 2016 vol. 759, s. 229–246.

315. Search for scalar leptoquarks in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS experiment.
M. Aaboud, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
New Journal of Physics 2016 vol. 18 art. no. 093016.

316. Search for single production of a vector-like quark via a heavy gluon in the 4b final state with the ATLAS detector in pp collisions at $\sqrt{s} = 8$ TeV.
G. Aad, [et al.], L. ADAMCZYK, [et al.], T. BOŁD, [et al.], W. DĄBROWSKI, [et al.], M. DYNDAŁ, [et al.], G. P. GACH, [et al.], I. GRABOWSKA-BOŁD, [et al.], D. KISIELEWSKA, [et al.], S. KOPERNY, [et al.], T. Z. KOWALSKI, [et al.], B. MINDUR, [et al.], M. PRZYBYCIEŃ, [et al.], A. ZEMŁA, [et al.].
Physics Letters. B 2016 vol. 758, s. 249–268.

317. Search for single production of vector-like quarks decaying into Wb in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector.
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Conference and seminar presentations

Invited lectures

1. M. Przybylski "Effect of electron confinement on magnetic properties of nanostructures",16th Czech&Slovak Conference on Magnetism 13-17.06.2016, Koszyce, Slovakia
2. M. Przybylski "Effect of electron confinement on magnetism of nanostructures" , Seminar of Boston Chapter of IEEE (at Northeastern University) 15.07.2016, Boston, USA
3. M. Przybylski "Granice nanotechnologii" Konferencja „Electron Technology (ELTE'2016)" 11-14.09.2016, Wisła, Poland
4. M. Przybylski "Limits to nanotechnology: from nanometers to femtosecunds", International Workshop on Advanced Materials Science and Nanotechnology (IWAMSN-2016) 8-12.11.2016, Ha Long City, Vietnam
5. M. Przybylski „Spektroskopia mössbauerowska w badaniach dynamiki nanocząstek". Środowiskowe Seminarium Fizyki Ciała Stałego 21.12.2016, Kraków, Poland
6. W. Bochniak, K. Pieła, A. Korbel, J. Przewoźnik, Physical properties of aluminum processed by the KOBO method, The 22nd international symposium on plasticity and its current applications advancements in theoretical and applied plasticity: proceedings of PLASTICITY'16: the twenty second international symposium on Plasticity and its current applications: Keauhou Bay, January 3–6, 2016
7. J. Lis, L. Chlubny, Cz. Kapusta, Processing of MAX phase materials using combustion technique, AMT 2016: Advanced Materials and Technologies: XXI physical metallurgy and materials science conference: Rawa Mazowiecka, June 5–8, 2016
8. Cz. Kapusta, K. Kollbek, J. Stępień, M. Sikora, K. Schneider, K. Zakrzewska, J. Szlachetko, "Study of oxide materials for energy applications with X-ray spectroscopies", 13th International Symposium and School on Synchrotron Radiation in Natural Science (ISSRNS-13): Ustroń-Jaszowiec, Poland, 13–18 June, 2016

9. Cz. Kapusta, T. Strączek, K. Goc, W. Prendota, J. Jurczyk, J. Lis, J. Szmyd, Magnetic field controlled thermal conductivity of composites, EUROTHERM-2016: 7th European Thermal-Sciences Conference: Kraków, Poland, 19–23 June 2016
10. J. Fedotova, A. Maximenko, M. Marszałek, J. Przewoźnik, Cz. Kapusta, J. Kasiuk, Perpendicular magnetic anisotropy in nanostructured films: correlation of morphology, structure and magnetic peoperties, NanoTech Poland international conference & exhibition: 22–25 June 2016, Poznań
11. W. Tabiś, Charge density wave order and the carrier density in cuprate superconductors SUPERSTRIPES 2016, 23-29 June 2016, Ischia, Italy.
12. W. Tabiś, Charge density wave order and the carrier density in cuprate superconductors, 2nd International Conference on Magnetism and Superconductivity, 25-30 September 2016, Zakopane, Poland
13. M. Chrobak, Z. Tarnawski, S. Sowa, N.-T.H. Kim-Ngan, M. Paukov, L. Havela, Superconducting phase transitions in milikelvin temperature range in U-15 at.8th International Workshop on Advanced Materials Science and Nanotechnology, IWAMSN 2016, 8-12 Listopad 2016, Ha Long City, Vietnam.
14. M. Lankosz, M. Grzelak, D. KRAUZE, P. WRÓBEL, B. OSTACHOWICZ, D. Adamek, L. Chmura Evaluation of chemical biomarkers in selected tumors with different grade of malignancy. 13th international symposium on Recent advances in environmental health research, Jackson, MS, USA, September 11–14, 2016.
15. M.Lankosz, M. Grzelak, M. Brzyszczyk, P. Wrobel, B. Ostachowicz, D. Adamek, L. Chmura, Quantification of selected elements in ovarian and brain cancers and their potential as a tissue classifier. Sample Treatment 2016, 2nd Caparica Christmas Conference on Sample Treatment: 5th–7th of December 2016, Caparica, Portugal.
16. K.Burda, A. Halas, A.Orzechowska, V.Derrien, A.Chumakov, P.Sebban, J.Fiedor, M.Zając, T.Ślęzak, J.Korecki Involvement of non-heme iron in long range regulatory mechanisms of electron and proton transfer within photosystems of type II. ESRF 2016 User Meeting, UDM2; "Dynamics of complex systems"; 8-10 February, Grenoble, Francja.
17. K.Burda Zielona energia hit czy mit? Polskie Towarzystwo Fizyczne, Oddział w Białymstoku, Białystok.
18. R. Szymańska Funkcja lipidów prenylowych w odpowiedzi Arabidopsis thaliana na stres. Seminarium Instytutu Biochemii, Wydział Biologii Uniwersytetu Warszawskiego, maj 2016.
19. Z. Matuszak Biofizyka komórki upigmentowanej. Podejście systemowe. Melanogeneza, melaniny, melanoma. Liczby, Komputery, Życie 2016, Ogólnopolska Konferencja Bioinformatyczna, 8-10 kwietnia 2016, Kraków, Polska.
20. H. Figiel Research of hydrogen storage systems using neutrons. 2nd Cracow's meeting on concepts related to Energy, 24-25 maj 2016, Kraków, Polska.
21. H. Figiel Perspektywy rozwoju obrazowania magnetyczno-rezonansowego. Jesienna Szkoła Fizyki Medycznej, 16-18 wrzesień 2016, Chorzów, Polska.

22. H. Figiel Od dozymetrii do fizyki medycznej na AGH. 25 lat Fizyki Medycznej w Poznaniu 29 wrzesień 2016, Poznań, Polska.
23. S. M. Dubiel Microscopic phenomena underlying macroscopic properties of Fe-Cr alloys. 9th International Symposium on the Industrial Applications of the Mössbauer Effect, ISIAME 2016, 4-8 September 2016, Cape Town, RPA.
24. S. M. Dubiel Microscopic phenomena in Fe-Cr alloys as seen by the Mössbauer spectroscopy. 12th International Conference on Solid State Chemistry, 18-23 September 2016, Prague, Republika Czeska.
25. W. Łużny, M. Śniechowski, T. Kozik, Challenge and adventure, or twenty years of searching for the model structure of the PANI/CSA conducting polymer system, XIPS 2016, 10th Int. Conference on X-Ray Investigations of Polymer Structure, Ustroń, Poland, December 6-9 (2016)
26. C. Braham, A. Baczmanski, G. Gonzalez, H. Sidhom, E. Gadalinska, S. Wronski, T. Buslaps, Study of stress partitioning in a 0.68%C pearlitic steel using high energy X-ray synchrotron radiation, 10th International Conference on Residual Stresses, Book of abstracts, p. 19, Sydney, Australia, 3-7 July (2016)
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28. I. Grabowska-Bołd (on behalf of the ATLAS Collaboration), Overview of ATLAS results. Hard Probes 2016, September 23-27, 2016, Wuhan, China
29. M. Przybycień (on behalf of the ATLAS Collaboration) Recent heavy ion results from the ATLAS experiment. The XXIII International Baldin Seminar on High Energy Physics Problems "Relativistic Nuclear Physics and Quantum Chromodynamics", 19-24 September, 2016, Dubna, Russia, EPJ Web. Conf.
30. T.Bołd (on behalf of the ATLAS Collaboration) Heavy ions measurements at ATLAS. Moriond QCD, Mar 19-25, 2016, La Thuille, Italy
31. M. Idzik, M. Firlej, T. Fiutowski, J. Moroń, K. Świentek, S. Bugiel, R. Dasgupta, M. Kuczyńska, J. Murdzek FLAME, an ASIC for luminometer at a future linear collider. 10th International Meeting on Front-End Electronics (FEE 2016), 30 May - 3 June 2016, Kraków Poland
32. K. Świentek (On behalf of LHCb UT collaboration) SALT ASIC for LHCb tracking. 10th International Meeting on Front-End Electronics (FEE 2016), 30 May - 3 June 2016, Kraków Poland
33. M. Idzik Compact forward calorimetry at future linear colliders. Workshop on "Energy and time measurement with High Granularity Silicon Devices", 13-14 June 2016 DESY, Germany
34. W. Dąbrowski Specjalizowane układy scalone w badaniach naukowych. ELTE'2016 technologia elektronowa, XII konferencja naukowa, Wisła, 11–14 września 2016

35. W. Dąbrowski Neutron transmutation doping of silicon. Town Meeting on IFMIF/ELAMAT Complementary Scientific Program, Rzeszów University of Technology, Poland, April 14-15, 2016
36. P. BOŻEK The Effect of Longitudinal Asymmetries in 3+1D Hydrodynamic Models. Opportunities for Exploring Longitudinal Dynamics in Heavy Ion Collisions at RHIC, Brookhaven National Laboratory, USA, January 20-22, 2016.
37. P. BOŻEK Collective dynamics in small systems. Critical Point and Onset of Deconfinement 2016, Wroclaw, Poland, May 30 - June 4, 2016.
38. P. BOŻEK Theory of pp/pA/small systems. The Fourth Annual Large Hadron Collider Physics Conference, Lund, Sweden, June 12-18, 2016.
39. P. BOŻEK Collective flow in relativistic nuclear collisions. Humboldt Kolleg on Particle Physics From the Vacuum to the Universe, Kitzbühel, Austria, June 27 - July 1, 2016.
40. P. BOŻEK Hydrodynamic flow in small systems. School on Collective Flows and Hydrodynamics in High Energy Nuclear Collisions, Hefei, China, December 14-15, 2016.
41. P. BOŻEK Hydrodynamics in small systems. Workshop on Flow, Jet Quenching and Strong Coupling Physics, Huzhou, China, December 17-19, 2016.
42. A. BZDAK Heavy Ions. XXII Cracow Epiphany Conference, Kraków, Poland, January 7-9, 2016.
43. A. BZDAK Longitudinal fluctuations of the medium created in heavy-ion collisions. Opportunities for Exploring Longitudinal Dynamics in Heavy Ion Collisions at RHIC, Brookhaven National Laboratory, USA, January 20-22, 2016.
44. A. BZDAK Multi-particle correlations, baryon stopping and non-binomial efficiency. Exploring the QCD Phase Diagram through Energy Scans, Seattle, USA, September 19 -October 14, 2016.
45. A. BZDAK Saturation scale fluctuations and multi-particle rapidity correlations. Workshop on QCD and Diffraction, Kraków, Poland, 5-7 December, 2016.
46. M. ZIMNOCH Metabolizm miejski – badanie bilansu antropogenicznych gazów cieplarnianych (CO2 i CH4) na przykładzie obszaru zurbanizowanego Krakówa. Seminarium Wydziału Inżynierii Środowiska Politechniki Warszawskiej, 28 czerwiec, 2016.
47. P. WACHNIEW, A. ŻUREK Polish perspective on nitrate degradation in groundwater. Workshop on Monitoring and Nitrate Reduction in Groundwater in the Baltic Sea Countries, Copenhagen, 14-15 March, 2016.
48. K. RÓŻAŃSKI Sylwetka Prof. Jerzego W. Niewodniczańskiego. Wystąpienie z okazji przyznania Prof. Niewodniczańskiemu nagrody im. A. Hoborskiego, Wydział Fizyki i Informatyki Stosowanej, 18 listopad, 2016
49. Ł. CHMURA Co fizycy widzą w chmurach? Wykład w ramach Małopolskiej Nocy Naukowców, 30 września, 2016.
50. J. BARTYZEL Co wisi w powietrzu? Wykład w ramach Małopolskiej Nocy Naukowców, 30 września, 2016.

51. J. Adamowski, P. Wojcik, M. Woloszyn, B. Spisak, "Nanowire-Based Spintronic Analogs of Optical Devices", BIT's 2nd Annual World Congress of Smart Materials, Singapore, Mar 4-6, 2016
52. J. Adamowski and P. Wojcik, "Spin-orbit control of spin-transistor operation in semiconductor nanowires", Energy Materials Nanotechnology Meeting on Quantum Matter, Mauritius, Nov 30-Dec 4, 2016,
53. Z. Burda, "Reducing wealth inequality in macro-economic systems by introducing tax on wealth", Conference MECO 41, Vienna, Austria, Feb 15-16, 2016
54. Z. Burda, "Adding and multiplying random matrices", Phase Transitions and Critical Phenomena Conference, Coventry, UK, Apr 6-8, 2016
55. Z. Burda, "Eigenvector statistics of the product of Ginibre matrices", Workshop on Random Product Matrices, ZIF Bielefeld, Germany, Aug 22-26, 2016
56. P.A. Kowalski, S. Łukasik, P. Kulczycki, „Methods of Collective Intelligence in Exploratory Data Analysis: A Research Survey", International Academic Conference on Computer Networks and Communication Technology, Xiamen, China, Dec 16-18, 2016
57. P. Kulczycki, "Data Analysis, Systems Research, and Applications", The State University of New York at Buffalo, USA, Sep 23th, 2016
58. P. Kulczycki, "Data Analysis, Systems Research, and Applications", The State University of New York at Fredonia, USA, Sep 26th, 2016
59. B. Szafran, A. Mreńca-Kolasińska, S. Heun, "Aharonov-Bohm interferometers: scanning probe microscopy and magnetic forces", 4th International Workshop on the Optical Properties of Nanostructures, Wrocław University of Technology, Poland, Feb 17–19, 2016
60. B. Szafran, E. Osika, "On the simulations of electric dipole resonance for quantum dots in III-Vs and carbon nanotubes", The Twelfth International School on Theoretical Physics Symmetry and Structural Properties of Condensed Matter, Rzeszów, Poland, Sep 5-10, 2016
61. Z. Burda, "Modelowanie rozkładu bogactwa", Krakówskie Konwersatorium Fizyczne, Kraków, Poland, Mar 10th, 2016
62. Z. Burda, "Modelowanie rozkładu bogactwa", Komisja Układów Złożonych PAU, Kraków, Poland, Mar 18, 2016
63. Z. Burda, "Reducing wealth inequality in a simple statistical model of macro-economy", Statistical Physics and Complexity Seminar, University of Edinburgh, UK, Nov 23rd, 2016
64. E. Osika, Instytut Fizyki Politechniki Wrocławskiej, "Przejścia spinowo-dolinowe w nanorurkach węglowych", Seminarium Coherence-Correlations-Complexity, Wrocław, Poland, Nov 23th, 2016
65. E. Osika, "Przejścia spinowo-dolinowe w nanorurkach Węglowych", Akademickie Centrum Materiałów i Nanotechnologii AGH, Środowiskowe Seminarium Fizyki Ciała Stałego, Kraków, Poland, Nov 30th,2016

66. K. Kolasiński, "Orbity wężowe na złączach np w grafenie", Seminarium Katedry Fizyki Teoretycznej Politechniki Wrocławskej, Wrocław, Poland, Nov 2nd, 2016
67. A. Mreńca-Kolasińska, "Ułamkowa kwantyzacja rezystancji w złączach n-p-n w grafenie", Seminarium Katedry Fizyki Teoretycznej Politechniki Wrocławskiej, Wrocław, Poland, Nov 2nd, 2016
68. P. Wójcik, "Spin transistor based on helical magnetic field", Department of Physics, Informatics and Matheamtics Seminar, University of Modena and Reggio Emilia, Italy, Sep 9th, 2016

Contributed presentations

1. J. Żukrowski, A. Błachowski, K. Komędera, K. Ruebenbauer, P. Bujak, A. Proń, and M. Przybylski „Dynamics of CuFeS2 nanoparticles embedded in organic matrix as seen by Mossbauer Spectroscopy" ORAL, XI Ogólnopolskie Seminarium Spektroskopii Mossbauerowskiej 19-22.06.2016, Radom-Turno, Poland
2. J. Żukrowski, K. Ruebenbauer, A. Błachowski, P. Bujak, A. Proń, M. Przybylski „Mossbauer spectroscopy of nanostructures – theory and experiment" ORAL, Magnetic NORTH V (Magnetism at Surfaces, Interfaces and in Nanostructures) 26-30.06.2016, Colorado Springs, USA
3. M. Dąbrowski, M. Cinal, M. Przybylski „Effect of electron confinement on magnetism of nanostructures" POSTER. Magnetic NORTH V (Magnetism at Surfaces, Interfaces and in Nanostructures) 26-30.06.2016, Colorado Springs, USA
4. A. Koziol-Rachwal, T. Slezak, B. Matlak, K. Matlak and J. Korecki. Growth and magnetic properties of ultrathin epitaxial FeO films and Fe/FeO bilayers on MgO(001), MMM Intermag, 11-15 January 2016, San Diego, USA, ORAL.
5. A. Koziol-Rachwal, T. Nozaki, V. Zayets, H. Kubota, A. Fukushima, S. Yuasa and Y. Suzuki. Effect of the MgO seed layer thickness on perpendicular magnetic anisotropy in Cr/ultrathin Fe/MgO, MMM Intermag, 11-15 January 2016, San Diego, USA ORAL.
6. W.M. Woch, M. Kowalik, M. Giebułtowski, R. Zalecki, S. Fiejdasz, Cz. Kapusta, Effect of the nanosized γ-Fe_2O_3 in bulk $GdBa_2Cu_3O_{7-\delta}$ on critical currents, Cracow Symposium on Physics and Chemistry of Materials, Cracow, Poland, 6th May 2016, CSPCM2016, POSTER.
7. Ł. Frocisz, J. Krawczyk, R. Dziurka, K. Górecki, G. Cios, Ł. Gondek, M. Skawińska, Microstructural and phase characterization of the Ti-Al intermetallic alloy, AMT 2016: Advanced Materials and Technologies, XXI Physical Metallurgy and Materials Science Conference, 5–8 June 2016, Rawa Mazowiecka, Poland ORAL.
8. M. Chrobak, W.M. Woch, M. Kowalik, R. Zalecki, M. Giebułtowski, J. Przewoźnik, Cz. Kapusta, G. Szwachta, Magnetoresistance study of c-axis oriented YBCO thin film CSMAG'16, 16th Czech and Slovak Conference on Magnetism, 13.-17. June 2016, Košice, Slovakia, (plakat).

9. D. Rybicki, M. Jurkutat, S. Reichardt, Cz. Kapusta, J. Haase, New phase diagram of all cuprate high temperature superconductors based on NMR, AMPERE NMR School: 12–18 June 2016, Zakopane: book of abstracts / ed. by S. Jurga; Adam Mickiewicz University in Poznań ORAL.
10. W. Prendota, S. Miyazawa, T. Strączek, K. Goc, Cz. Kapusta, A. Takasaki, Crystallographic structure study of Fe64Mn30Si6 shape memory alloys, 13th International Symposium and School on Synchrotron Radiation in Natural Science (ISSRNS-13): Ustroń-Jaszowiec, Poland, 13–18 June, 2016. POSTER.
11. T. Strączek, S. Fiejdasz, W. Prendota, K. Goc, J. Jurczyk, J. Przewoźnik, Sz. Zapotoczny, M. Nowakowska, J. Szmyd, Cz. Kapusta, EXAFS study of Mn and Ni doped maghemite nanoparticles, Synchrotron Radiation in Natural Science: 13th International Symposium and School on Synchrotron Radiation in Natural Science (ISSRNS-13): Ustroń-Jaszowiec, Poland, 13–18 June, 2016. POSTER.
12. J. Stępień, M. Sikora, D. Pomykalska, Cz. Kapusta, Local atomic structure evolution around dopant ions in YSZ+Mn solid solution, , 13th International Symposium and School on Synchrotron Radiation in Natural Science (ISSRNS-13): Ustroń-Jaszowiec, Poland, 13–18 June, 2016. (plakat).
13. A. Czajka, A. Jurczyk, T. Straczek, M. Kasprzyk, M. Sroda, Cz. Kapusta, XAS study of oxide-fluoride glass-ceramics, 13th International Symposium and School on Synchrotron Radiation in Natural Science (ISSRNS-13): Ustroń-Jaszowiec, Poland, 13–18 June, 2016. POSTER.
14. K. Goc, T. Strączek, W. Prendota, W. Tokarz, M. Kapusta, L. Chlubny, J. Lis, Cz. Kapusta, XAS study of Ti-Al-C and Ti-Al-N based MAX phases, 13th International Symposium and School on Synchrotron Radiation in Natural Science (ISSRNS-13): Ustroń-Jaszowiec, Poland, 13–18 June, 2016. POSTER.
15. K. Goc, K. Gąska, Ł. Jarosiński, W. Prendota, Cz. Kapusta, A. Rybak, G. Kmita, Magnetic field aligned epoxy matrix composites filled with ferrite and magnetite powders, EUROTHERM-2016: 7th European Thermal-Sciences Conference: Kraków, Poland, 19–23 June 2016 ORAL
16. W. Prendota, S. Miyazawa, K. Goc, T. Strączek, J. Zukrowski, Cz. Kapusta, A. Takasaki, Magnetic study of the Fe-Mn-Si shape memory alloys, EUROTHERM-2016: 7th European Thermal-Sciences Conference: Kraków, Poland, 19–23 June 2016 ORAL
17. T. Strączek, K. Goc, W. Prendota, J. Jurczyk, J. Żukrowski, D. Rybicki, Cz. Kapusta, S. Fiejdasz, [et al.], J. Szmyd, Study of relaxation processes of magnetic nanoparticles, EUROTHERM-2016: 7th European Thermal-Sciences Conference: Kraków, Poland, 19–23 June 2016 ORAL
18. K. Wieczerzak, P. Bała, R. Dziurka, T. Tokarski, T. Kozieł, Ł. Gondek, Effect of temperature on evolution of eutectic carbides reaction in rapidly solidified Fe-Cr-C alloy, The 5th Stanisław Gorczyca European School on Electron Microscopy and Electron Tomography, 5-8 July 2016, Kraków, Poland. POSTER

19. K. Wieczerzak, P. Bała, R. Dziurka, T. Tokarski, T. Kozieł, Ł. Gondek, Lattice parameter changes of eutectic carbides in rapidly solidified hypoeutectic Fe-Cr-C alloy during heating, AGH-HU joint symposium 2016, 29–31 July 2016, Sapporo, Japan. ORAL

20. T. Nozaki, A. Kozioł-Rachwał, W. Skowroński, V. Zayets, Y. Shiota, S. Tamaru, H. Kubota, A. Fukushima, S. Yuasa, and Y. Suzuki, Voltage-controlled magnetic anisotropy in an ultrathin Fe layer sandwiched between Cr and MgO layers, International Conference of the Asian Union of Magnetics Societies, Tainan, Taiwan, 1-5 August, 2016 ORAL

21. K. Wieczerzak, P. Bała, R. Dziurka, T. Tokarski, T. Kozieł, Ł. Gondek, Microstructural evolution in rapidly solidified Fe-Cr-C alloy, Kyoto-Kraków Symposium on Materials Science, 2 August 2016, Kyoto, Japan ORAL

22. J. Kasiuk, A. Fedotov, J. Przewoźnik, Cz. Kapusta, V. Skuratov, J. Fedotova, Enhancement of perpendicular magnetic anisotropy in FeCoZr-CaF2 nanocomposite films by combined influence of nanoparticles oxidation and ion irradiation, JEMS 2016. 8th Joint European Magnetic Symposia: 21–26 August 2016, Glasgow, UK. POSTER

23. A. Szkudlarek, P. Ozga, Cz. Kapusta, J. Michalik, Focused-Electron-Beam-Induced-Etching of graphene with water, Grafen i inne materiały 2D [Dokument elektroniczny]: II krajowa konferencja: 12–14 września 2016 r., Szczecin, 2nd Polish conference "Graphene and 2D materials" ORAL

24. M. Krupska, T.H. Kim-Ngan, S. Sowa, Z. Tarnawski, L. Havela, P. Malinsky, A. Mackova, Ion Beam Mixing and Interdiffusion in Magnetite Thin Films Nanomaterials: Application & Properties '2016, wrzesień 14-19, 2016, Lviv, Ukraine. ORAL

25. S. Fiejdasz, J. Lewandowska-Łańcucka, A. Szpak, Ł. Rodzik, W. Prendota, Cz. Kapusta, Sz. Zapotoczny, M. Nowakowska, Iron oxide and silica based nanosystems in modern medicine and diagnostics, Tera'2016 Seminar 'New Materials and Techniques in the Theranostics of Degenerative Diseases', Kraków, Poland, 23rd September 2016. POSTER

26. M. Chrobak, W. Tokarz, Z. Kąkol, A. Kozłowski, Z. Tarnawski, M. Sikora, J. I. Miotkowski, STM/STS and magnetoresistance studies of Bi 1.96 Mg 0.04 Se 3 single crystal, 2nd International Conference on Magnetism and Superconductivity, 25-30 September 2016, Zakopane, Poland, POSTER.

27. I. Biało, T. Kołodziej, A. Kozłowski, W. Tabis, E. Lorenzo, L. Paolassini, G. Yu, M. K. Chan and M. Greven, C-axis-polarized phonons in optimally doped HgBa2CuO4+δ studied by inelastic X-ray scattering, 2nd International Conference on Magnetism and Superconductivity, 25-30 September 2016, Zakopane, Poland POSTER

28. M. Nowakowska, [et al.], Cz. Kapusta, [et al.] Superparamagnetic iron oxide nanoparticle contrast for targeted magnetic resonance imaging of vascular endothelium inflammation, 25th biomaterials in medicine and veterinary medicine: 13–16 October 2016 Rytro, Poland ORAL

29. A.Kozioł-Rachwał, T. Nozaki, V. Zayets, H. Kubota, A. Fukushima, S. Yuasa and Y. Suzuki, Vanadium-induced modification of magnetic anisotropy in Cr/ultrathin Fe/MgO, MMM, 31 October – 4 November 2016, New Orleans, USA. ORAL
30. A. Kozioł-Rachwał, T. Nozaki, V. Zayets, H. Kubota, A. Fukushima, S. Yuasa and Y. Suzuki. Influence of ultrathin Cr insertion on perpendicular magnetic anisotropy and its electric field induced change at Fe/MgO interface, MMM, 31 October – 4 November 2016, New Orleans, USA. ORAL
31. M. LANKOSZ, M. GRZELAK, D. KRAUZE, M. Brzyszczyk, M. CZYŻYCKI, P. WRÓBEL, D. Adamek, L. Chmura Sub-cellular elemental imaging of epithelial ovarian cancers and their potential as a tissue classifier. XRM 2016 13th International Conference on X-Ray Microscopy: 15 – 19 August 2016, Oxford, United Kingdom POSTER
32. Z. STĘGOWSKI Third Research Coordination Meeting of the Coordinated Research Project on "Radiometric Methods for Measuring and Modelling Multiphase Systems Towards Industrial Processes". International Atomic Energy Agency, Vienna, Austria, 11 – 15 April 2016 ORAL
33. L. SAMEK Presentation of studies performed in Poland during realization of regional project Apportioning Air Pollution Sources on a Regional Scale. IAEA, RER/1/015,10-13 October 2016, Tirana, Albania. ORAL
34. A. D. Surowka, M. Töpperwien, T. Salditt, M. Sprung, J.D. Nicolas, M. Bernhardt, M. Osterhoff, B. Hartmann, M. Szczerbowska-Boruchowska Combination of X-Ray Phase Contrast Imaging (XPCI) and Synchrotron X-Ray Fluorescence Waveguide Imaging (SR-XRF) to get rid of the mass thickness effect – a case study on the human substantia nigra tissue. DESY Users' meeting 2016, 27-29 styczeń 2016, Hamburg, Niemcy. POSTER
35. A. Ziomber, A. D. Surowka, P. Wrobel, M. Szczerbowska-Boruchowska The influence of transcranial Direct Current Stimulationon the elemental composition of brain structures in obese rats – the EDXRF study. European Conference on X-Ray Spectrometry (EXRS) 2016. 19-24 czerwiec 2016, Gothenborg, Sweden. POSTER
36. A.D. Surowka, M. Töpperwien, M. Bernhardt, J.D. Nicolas, M. Osterhoff, T. Salditt, D. Adamek, M. Szczerbowska-Boruchowska An integrated approach to unravel the interplay between structural and chemical properties of substantia nigra neurons in the elderly. X-ray Microscopy Conference (XRM) 2016. 15-19.08.2016, Oxford, UK ORAL
37. J. Dudała, M. Białas, M. Bereza-Buziak, A. Hubalewska-Dydejczyk, A. Budzyński, M. Pędziwiatr, M. Kołodziej, M. Lankosz The possibility of the use of infrared spectroscopy as a tool supporting the diagnosis of the adrenal glands diseases. Seminar FTIR imaging in the micro- and nanoscale. The molecular structure and its spatial distribution, Kraków 16-17 VI 2016. POSTER
38. M. Grzelak, M. Lankosz, M. SZczerbowska-Boruchowska, D. Adamek, Ł. Chmura Research on biophysical changes in ovarian cancers tissues in relations to control tissues by FTIR spectroscopy. Seminar FTIR imaging in the micro- and nanoscale. The molecular structure and its spatial distribution, Kraków 16-17 VI 2016. POSTER

39. M. Grzelak, M. Lankosz, B. Ostachowicz, D. Adamek, L. Chmura Application of the TXRF and XANES method for analysis of ovarian cancer cyst fluids. EXRS2016 : European Conference on X-Ray Spectrometry: June 19–24, 2016, Gothenburg, Sweden. POSTER
40. P. WRÓBEL, P. Frączek, M. LANKOSZ Removal of absorption artefacts on the elemental distribution images of paint layers acquired with tabletop macro-XRF setup. EXRS2016 : European Conference on X-Ray Spectrometry: June 19–24, 2016, Gothenburg, Sweden. POSTER
41. M. Golasik, P. WRÓBEL, T. Librowski, M. Olbert, B. Nowak, M. LANKOSZ, W. Piekoszewski Study of the distribution profile of titanium in rats by micro synchrotron radiation based X-ray fluorescence. EXRS2016 : European Conference on X-Ray Spectrometry: June 19–24, 2016, Gothenburg, Sweden. POSTER
42. P.M.WRÓBEL, T. FIUTOWSKI, P.FRACZEK, S. KOPERNY, M. LANKOSZ, A. MENDYS, B. MINDUR, A. SIKORSKA, K. ŚWIENTEK, P. WIĄCEK, W. DĄBROWSKI A new full-field XRF imaging system for non-invasive investigation of paintings. EXRS2016 : European conference on X-Ray Spectrometry : June 19–24, 2016, Gothenburg, Sweden. ORAL
43. M.CZYZYCKI,P.WROBEL,L.Chmura, W.H.Schroeder, G. Falkenberg, D. Adamek, M.LANKOSZ, X-ray tomography of a human cerebellum tissue. EXRS2016 : European Conference on X-Ray Spectrometry : June 19–24, 2016, Gothenburg, Sweden. POSTER
44. P. M. Wrobel, P. Fraczek, and M. Lankosz A new methodology for removal of absorption artefacts in the macro-xrf imaging of paint layers. 6th Meeting X-ray and other techniques in investigations of the objects of cultural heritage, Kraków, 19-21 Maj 2016. POSTER
45. P. M. Wróbel, T. Fiutowski, P. Frączek, S. Koperny, M. Lankosz, A. Mendys, B. Mindur, A. Sikorska, K. Świentek, P. Wiącek, W. Dąbrowski Optimisation of the geometry of the full-field xrf imaging system based on gaseous detector. 6th Meeting X-ray and other techniques in investigations of the objects of cultural heritage, Kraków, 19-21 Maj 2016 POSTER
46. M. CZYŻYCKI, P. WRÓBEL, et al. Analytical capabilities and applications developed at the IAEA multi-purpose X-ray spectrometry end-station at the XRF beamline of Elettra Sincrotrone Trieste. EXRS2016 : European Conference on X-Ray Spectrometry: June 19–24, 2016, Gothenburg, Sweden. ORAL
47. L. Fiedor, A. Wiśniewska-Becker, Heriyanto,M. Zbyradowski, J. Catapano, M.Duda, J.Fiedor, D. Cvetkovic, J. Stanojevic Carotenoids – not always so good. The mechanisms of their pro-oxidant activity. III International Scientific Conference, Oxygenalia 2016, 18-19 November, Kraków, Poland. ORAL
48. S. Krysiak, A. Orzechowska, J. Fiedor, R. Szymanska, K. Burda Influence of external proteins on heterogeneity of oxygen evolution in photosystem II. The 17th International Congress on Photosynthesis Research, 7-12 August, Maastricht 2016, Holandia. POSTER

49. K. Burda, A. Halas, V. Derrien, A.Chumakov, P. Sebban, A.Orzechowska, J.Fiedor, T. Slezak, J Korecki, M. Zajac Involvement of non-heme iron in long range regulatory mechanisms of electron and proton transfer within bacterial reaction centers of type II (R. sphaeroides). The 17th International Congress on Photosynthesis Research, 7-12 August, Maastricht 2016, Holandia. POSTER
50. A.Jung, P. Krisper, P. Korohoda, V. Stadlbauer-Köllner, D. Schneditz Single compartment model for kinetics of bile acids during extracorporeal liver support therapy. XLIII Annual Congress of the European Society for Artificial Organs, 14-17 September 2016, Warsaw, Poland. ORAL
51. J. Cieslak, J. Tobola, K. Berent and M. Marciszko Phase coexistence in AlxFeNiCrCo high entropy alloys: experimental and theoretical study. XX International Conference on Solid Compounds of Transition Elements, 11-15 April 2016, Zaragoza, Spain. ORAL
52. J. Chwiej, A. Skoczeń, A. Patulska, K. Matusiak, K. Janeczko, M. Ciarach, C. Sandt, F. Borondics, R. Simon i Z. Setkowicz Mikroskopia FTIR i rentgenowska w badaniach nad patogenezą padaczki i mechanizmami przeciwdrgawkowego działania diety ketogenicznej. Konferencja Obrazowanie FTIR w mikro- i nanoskali: Struktura molekularna a jej dystrybucja przestrzenna, 16-17 czerwca 2016, Kraków, Polska. ORAL
53. J. Cieslak, J. Tobola, K. Berent, M. Marciszko Badania stopów wysokiej entropii otrzymanych metoda spiekania. Ogólnopolskie Seminarium Spektroskopii Mossbauerowskiej, 19-22 czerwca 2016, Turno. ORAL
54. Z. Matuszak Electron-donor acceptor properties of melanin studied by EPR and redox potentiometry. IV Forum EMR-PL, 27-29 June 2016, Poznan, Poland. ORAL
55. J. Cieslak, J. Tobola, K. Berent and M. Marciszko Phase coexistence in AlxFeNiCrCo high entropy alloys: experimental and theoretical study. International Conference on High-Entropy Materials, 6-9 November 2016, Hsinchu, Taiwan. ORAL
56. J. Cieslak, J. Tobola, K. Berent and M. Marciszko Phase coexistence in AlxFeNiCrCo high entropy alloys: experimental and theoretical study. C-MAC Days, 21-23 November 2016, Bratislava, Slovakia. ORAL
57. J. Cieslak, M. Reissner and J. Tobola Magnetic properties of sigma-FeCrCo alloys. XX International Conference on Solid Compounds of Transition Elements, 11-15 April 2016, Zaragoza, Spain. POSTER
58. A.Skoczeń, Z. Setkowicz, K. Matusiak, C. Sandt, J. Chwiej Spektroskopia FTIR w badaniach wpływu diet wysokotłuszczowych o różnym stosunku ketogenicznym na akumulację kreatyny. Konferencja Obrazowanie FTIR w mikro- i nanoskali: Struktura molekularna a jej dystrybucja przestrzenna, 16-17 czerwca 2016, Kraków, Polska. POSTER
59. K. Kłodowski, A. T. Krzyżak Analytical description of the B-matrix spatial distribution in Diffusion Tensor Imaging. AMPERE NMR School, 12-18 June 2016, Zakopane, Poland. POSTER
60. A.Budziak, H. Figiel, D. Wójcik, A. Hoser, A. Dębski, G. Cios C-P-T and in-situ neutron diffraction study of deuterium absorption by HoMn. 15th International Symposium on Metal-Hydrogen Systems, 7-12 August 2016, Interlaken, Switzerland. POSTER

61. K. Kłodowski, P. Łukasik, A. T. Krzyżak Approximation of the actual spatial distribution of the b-matrix in diffusion tensor imaging with bivariate polynomials. FedCSIS 2016, 11-14 September 2016, Gdansk, Poland. POSTER
62. S. M. Dubiel, J. Przewoźnik Discovery and characterization of magnetism in sigma-phase Fe-Mo compounds. 20th International Conference on Solid State Compounds of Transition Elements, SCTE 2016, 11-15 April 2016, Saragossa, Hiszpania. ORAL
63. S. M. Dubiel, J. Żukrowski Mösbauer spectroscopic study of a Fe65.9V34.1 alloy. 20th International Conference on Solid State Compounds of Transition Elements, SCTE 2016, 11-15 April 2016, Saragossa, Hiszpania. POSTER
64. S. M. Dubiel, J. Żukrowski Magnetic and dynamic properties of a Fe65.9V34.1 alloy. 2nd Mediterranean Conference on the Applications of the Mössbauer Effect, MECAME 2016, 31 May – 4 June 2016, Cavtat, Chorwacja . ORAL
65. S. M. Dubiel, J. Żukrowski (a) Effect of He+ and Fe3+ ion irradiation on Cr atom distribution in Fe-Cr alloys, (b) Effect of strain on distribution of Cr atoms in FeCr10. EUROfusion-IREMEV Monitoring Meeting, 7-9 June 2016, Alicante, Hiszpania. ORAL
66. S. M. Dubiel, J. Żukrowski (a) Effect of Fe3+ ion irradiation on the sigma-phase Fe-Cr alloy, (b) Phase separation in a Fe15Cr alloy at 402oC. EUROfusion-IREMEV Monitoring Meeting, 15-17 November 2016, Garching, Niemcy. ORAL
67. S. Strzałka, J. Wolny. Modele wielowymiarowe kwazikryształów z perspektywy przestrzeni fizycznej, 58 Konwersatorium krystalograficzne, Wrocław, 22–24 VI (2016) POSTER
68. I. Bugański, R. Strzałka, J. Wolny. Phason flips for an icosahedral quasicrystal, 58 Konwersatorium krystalograficzne, - Komitet Krystalografii PAN, Wrocław, 22–24 VI (2016) POSTER
69. M. Chodyń, P. Kuczera and J. Wolny, Generalized Penrose Tiling as a model for structure refinement of decagonal quasicrystals, 58 Konwersatorium krystalograficzne Wrocław, 22–24 VI (2016) POSTER
70. M. Chodyń, P. Kuczera and J. Wolny, Generalized Penrose Tiling as a model for structure refinement of decagonal quasicrystals, AGH-HU joint symposium, Sapporo, Japan, July 29–31 (2016) ORAL
71. I. Bugański, R. Strzałka, J. Wolny, Phasonic correction for quasicrystals - new definition, AGH-HU joint symposium, Sapporo, Japan, July 29–31 (2016) - ORAL
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171. K. RÓŻAŃSKI, M. GAŁKOWSKI, Ł. CHMURA, M. DULIŃSKI Impact of moisture source regions on the isotopic composition of precipitation events at high-mountain continental site Kasprowy Wierch, southern Poland, EGU General Assembly 2016, Vienna, Austria, 17-22 April, 2016. POSTER
172. P. JODŁOWSKI, P. WACHNIEW, J. NOWAK Self-attenuation correction determination based on sample chemical composition in gamma-spectrometry of Pb-210 - Requirements for the scope of chemical analyses. 1st International Conference on Radioanalytical and Nuclear Chemistry (RANC-2016), Budapest, Hungary,10-15 April, 2016. POSTER
173. P. JODŁOWSKI, J. MACUDA, J. NOWAK, C. D. NGUYEN Promieniotwórczość naturalna odpadów eksploatacyjnych powstających w trakcie poszukiwań gazu łupkowego w Polsce, VII Konferencja Radiochemii i Chemii Jądrowej, Lublin, 17-20 kwietnia, 2016 ORAL
174. T. MICHALCZYK, D. BAR-MICHALCZYK, J. KANIA, G. MALINA, T. SZKLARCZYK, S. WITCZAK, A. ŻUREK, K. RÓŻAŃSKI, P. WACHNIEW, D. ZIĘBA Ocena migracji azotanów w obszarze zasilania ujęcia wód podziemnych Wierzchowisko w świetle badań projektu BONUS-Soils2Sea. Aktualne rozwiązania ujmowania i eksploatacji wód podziemnych. Konferencja Naukowa, Częstochowa, 2-3 czerwca, 2016. ORAL
175. P. WACHNIEW, D. ZIĘBA, K. RÓŻAŃSKI, T. MICHALCZYK, D. BAR-MICHALCZYK, J. KANIA, A. ŻUREK, G. MALINA, S. WITCZAK Wykorzystanie cieków powierzchniowych w monitorowaniu jakości eksploatowanych zbiorników wód podziemnych, Aktualne rozwiązania ujmowania i eksploatacji wód podziemnych. Konferencja Naukowa, Częstochowa, 2-3 czerwca, 2016. ORAL

176. K. RÓŻAŃSKI, M. GAŁKOWSKI, Ł. CHMURA, M. DULIŃSKI Isotopic composition of daily precipitation at high-mountain site Kasprowy Wierch, southern Poland: impact of moisture source regions and rainout history of moist air masses, Joint European Stable Isotopes User Group Meeting, Gent, Belgium, 4–9 September, 2016. POSTER
177. A. JASEK, M. ZIMNOCH, T. KUC, K. RÓŻAŃSKI Partitioning of CO2 sources In an Urban area. Joint European Stable Isotopes User Group Meeting, Gent, Belgium, 4–9 September, 2016. POSTER
178. P. WACHNIEW, D. BAR-MICHALCZYK, J. KANIA, G. MALINA, T. MICHALCZYK, K. RÓŻAŃSKI, S. WITCZAK, D. ZIĘBA, A. ŻUREK Understanding of a coupled groundwater - surface water system as a framework for mitigation of nitrate pollution in an agricultural catchment. 43rd IAH Congress, Montpellier, France, 25-29 September, 2016. ORAL
179. P. WACHNIEW, J. KANIA, T. SZKLARCZYK, S. WITCZAK, T. MICHALCZYK, K. RÓŻAŃSKI, M. DULIŃSKI Calibration of transient transport model for fissured-karstic aquifer in southern Poland with the aid of tritium data. 43rd IAH Congress, Montpellier, France, 25-29 September, 2016. POSTER
180. A. JASEK, M. ZIMNOCH, K. RÓŻAŃSKI Impact of atmospheric stability on CO2 and CH4 fluxes in an Urban area of Kraków, Poland, 2nd ICOS Science Conference, Helsinki, Finland, 27-29 September, 2016. POSTER
181. M. GAŁKOWSKI, Ch. GEBRIG, Ł. CHMURA, J.M. NĘCKI, M. ZIMNOCH, K. RÓŻAŃSKI How to determine anthropogenic contributions to the CO2 and CH4 mole fractions from local and regional sources?, 2nd ICOS Science Conference, Helsinki, Finland, 27-29 September, 2016. POSTER
182. B. WINIARSKA, P. STOCH, J. PSZCZOŁA. Crystal structure and electron band structure of the Tb0.27Dy0.73(Fe1-xAlx)2 intermetallics (x = 0, 0.1, 0.2), Symposium on Physics and Chemistry of Materials, Kraków, May 6, 2016. POSTER
183. M. SZKLARSKA-ŁUKASIK, J. CHMIST, J. PSZCZOŁA Crystal structure and electrical properties of the Tb0.27Dy0.73(Fe0.7-xNixCo0.3)2 compounds, Symposium on Physics and Chemistry of Materials, Kraków, May 6, 2016. POSTER
184. B. WINIARSKA, M. SZKLARSKA-ŁUKASIK, P. MUDRAK, A. FILIPEK, J. PSZCZOŁA Crystal structure and magnetostriction of the (Tb0.27Dy0.73)1-xYxFe2 series, Symposium on Physics and Chemistry of Materials, Kraków, May 6, 2016. POSTER
185. M. Charytanowicz, J. Niewczas, P. Kulczycki, P.A. Kowalski, S. Łukasik, "Discrimination of wheat grain varieties using X-ray images", 5th International Conference on Information Technologies in Biomedicine, Kamień Śląski, Jun 20-22, 2016 ORAL
186. T. Chwiej, "Application of the picosecond magnetic pulses for inducing an electron motion in the bilayer nanowire", 45th International School & Conference on the Physics of Semiconductors Jaszowiec 2016, Szczyrk, Poland, Jun 18-24, 2016 ORAL
187. T. Chwiej, "The effect of temporary magnetic hybridization of electron's wave functions on the charge flow in semiconductor bilayer nanostructure", The Twelfth International

School on Theoretical Physics Symmetry and Structural Properties of Condensed Matter, Rzeszów, Poland, Sep 5-10, 2016 ORAL

188. P. Gawroński, A. Chizhik, K. Kułakowski, "Micromagnetic simulations of the remagnetization process in Fe-rich glass covered wires, Joint European Magnetic Symposia", Glasgow, UK, Aug 21-26, 2016 POSTER

189. S. Łukasik, P.A. Kowalski, M. Charytanowicz, P. Kulczycki, "Clustering using Flower Pollination Algorithm and Calinski-Harabasz Index", 2016 IEEE Congress on Evolutionary Computation, Vancouver, Canada, Jul 24-29, 2016 ORAL

190. J. Kamiński, B. Trzewiczek, S. Wroński, J. Tarasiuk, "Computer simulation of mechanical properties of bone tissue based on automated processing of micro-CT measurements and micro-FE results", Biomechanics 2016 : International Conference of the Polish Society of Biomechanics, Biała Podlaska, Poland, May 9th, 2016 POSTER

191. J. Kamiński, B. Trzewiczek, S. Wroński, J. Tarasiuk, "Automated processing of micro-CT scans using descriptor-based registration of 3D images", International Conference on Systems Science 2016, Wroclaw, Sep 8th ,2016 ORAL

192. K. Kolasiński, A. Mrenca, B. Szafran, " Quantum transport theory for systems with disorder", 40th International Conference of Theoretical Physics, Ustroń Sep 4-9, 2016 POSTER

193. K. Kolasiński, Instytut Neela, "Modeling the double slit experiment in systems with 2DEG", Grenoble, France, QNES Group Seminar, Mar 17, 2016 ORAL

194. K. Kolasiński, H. Sellier, B. Szafran, "Simulations of scanning gate microscopy imaging of the spin-orbit interaction in 2DEG in presence of in-plane magnetic field", 45th Jaszowiec - 2016 international school and conference on the Physics of semiconductors", Szczyrk, Poland, Jun 18-24. 2016 POSTER+ORAL

195. Krzysztof Kolasiński, H. Sellier, B. Szafran, "Spin-orbit coupling measurement in disordered wires – simulations", The 11-th Capri Spring School on Transport in Nanostructures, Capri, Italy, Apr 10-17, 2016 POSTER

196. P.A. Kowalski, S. Łukasik, M. Charytanowicz, P. Kulczycki, "Clustering based on the Krill Herd Algorithm with Selected Validity Measures", 2016 Federated Conference on Computer Science and Information Systems, Gdańsk, Poland, Sep 11-14, 2016 ORAL

197. P.A. Kowalski, S. Łukasik, M. Charytanowicz, P. Kulczycki, "Comparison of Krill Herd Algorithm and Flower Pollination Algorithm in Clustering Task", 8th European Symposium on Computational Intelligence and Mathematics, Sofia, Bulgaria, Oct 5-8, 2016 ORAL

198. M. Krawczyk, "Equivalence of nodes in symmetric networks", NetSci-X, Wrocław, Poland, Jan 11-13, 2016 ORAL

199. M. J. Krawczyk and K.Kułakowski, "A small chance of paradise - equivalence of balanced states", Conference on Complex Systems CCS'16, Amsterdam, The Netherlands, Sep 18-22, 2016 POSTER

200. P. Kulczycki, M. Charytanowicz, P.A. Kowalski, S. Łukasik, "Atypical (Rare) Elements Detection – A Conditional Nonparametric Approach", Computational Modeling of Objects Presented in Images: Fundamentals, Methods, and Applications, Niagara Falls, USA, Sep 21-23, 2016 ORAL
201. K. Kułakowski, F. Hassanibesheli, L. Hedayatifar, "Jammed states, Heider balance and paradise", Social Simulation Conference, Rome, Italy, Sep 19-23, 2016 ORAL
202. K. Kułakowski, M. Pomorski, M. Krawczyk, , J. Kwapien and M. Ausloos, "Inferring American regions from correlation networks of given baby names" NetSci-X Conference, January 11-13, 2016 Wrocław, Poland POSTER
203. K. Malarz, K. Kułakowski, "Ising-like systems without temperature", Phase Transitions and Critical Phenomena Conference, Coventry, UK, Apr 6-8, 2016 POSTER
204. M. P. Nowak, "Subband-mixing signatures in Andreev-reflection-enhanced conductance of a quantum point contact", Topological States of Matter, San Sebastian, Spain, Sep 5-9, 2016 POSTER
205. A. Nowosielski, P.A. Kowalski, P. Kulczycki, "The Column-oriented Data Store Performance Considerations", 2016 Federated Conference on Computer Science and Information Systems, Gdańsk, Poland, Sep 11-14, 2016 ORAL
206. E. Osika, B. Szafran, "Double quantum dots in bent carbon nanotubes: electronic structure and spin-valley dynamics of (1e,1h) states", The 9th International Conference on Quantum Dots, Jeju, Korea, May 22-27, 2016 POSTER
207. A. Mreńca-Kolasińska, S. Heun, B. Szafran, "Aharonov-Bohm effect along a circular n-p junction in graphene nanoribbon", Graphene Week 2016, Warszawa, Poland, Jun 13-17, 2016 POSTER
208. A. Mreńca-Kolasińska, S. Heun, B. Szafran, "Gate-induced Aharonov-Bohm interferometer in graphene nanoribbon", 45th Jaszowiec International School and Conference on the Physics of Semiconductors, Szczyrk, Poland, Jun 18-24, 2016 ORAL
209. A. Mreńca-Kolasińska„ K. Kolasiński, B. Szafran, "Fractional quantization of quantum Hall longitudinal resistance in n-p-n graphene junctions with split gates", 40th International Conference of Theoretical Physics, Correlations and Coherence at Different Scales, Ustroń, Poland, Sep 4-9, 2016 POSTER
210. A. Mreńca-Kolasińska, K. Kolasiński, B. Szafran, Graphene Workshop, "Fractional quantization of longitudinal resistance in split-gate-defined graphene quantum point contact", Basel University, Switzerland, Oct 17-18, 2016. ORAL
211. T. Palutkiewicz, M. Wołoszyn, P. Wójcik, B.J. Spisak, "Transport Characteristics of Gated Core-Multishell Nanowires: Self-Consistent Approach", 45th Jaszowiec International School and Conference on the Physics of Semiconductors, Szczyrk, Poland, Jun 18-24, 2016 POSTER
212. B.J. Spisak, M. Wołoszyn, U. Kaczor, "Phase-space approach to position-momentum correlations induced by the quantum interference phenomena in resonant-tunneling nanosystems", The Twelfth International School on Theoretical Physics Symmetry and Structural Properties of Condensed Matter, Rzeszów, Poland, Sep 5-10, 2016 POSTER

213. E. Wach, B. Szafran, "Numerical simulations of imaging of the charge density confined in the planar quantum dots in transition to fractional quantum Hall regime", The 9th International Conference on Quantum Dots, Jeju, South Korea , May 22-27, 2016 POSTER

214. E. Wach, B. Szafran, "Numerical simulations of the Coulomb blockade microscopy experiments: probing the local properties of the planar quantum dots using the scanning gate technique", 45th Jaszowiec International School and Conference on the Physics of Semiconductors, Szczyrk, Poland Jun 18-24, 2016 POSTER

215. M. Wołoszyn, "Zastosowanie funkcji Wignera do analizy własności transportowych układów kwaziperiodycznych", XXI Minisympozjum Fizyki Statystycznej, Poznań, Poland, Dec 9th, 2016 ORAL

216. P. Wójcik, J. Adamowski, "Electrically controlled spin-transistor operation in helical magnetic field" The Twelfth International School on Theoretical Physics Symmetry and Structural Properties of Condensed Matter, Rzeszów, Poland, Sep 5-10, 2016 POSTER

217. D. Żebrowski, B. Szafran, F.M. Peeters, "Aharonov-Bohm effect along a circular n-p junction in graphene nanoribbon—", Graphene Week 2016, Warszawa, Poland, Jun 13 -17, 2016 POSTER

218. D. Żebrowski, B. Szafran, F.M. Peeters, "The finite-flake graphene quantum dots in the presence of spin-orbit coupling", 45 th Jaszowiec International School and Conference on the Physics of Semiconductors, Szczyrk, Poland, Jun 18-24, 2016 POSTER

Faculty Seminar

1. 2016/12/16, 12:15 Spotkanie przedświąteczne
2. 2016/12/09, 12:15, dr inż. Tomasz Bołd (KOiDC WFiIS AGH) System filtracji przypadków eksperymentu ATLAS, czyli o szukaniu igły w stogu siana
3. 2016/12/02, 12:15, Prof. Christian Scheffzuk (Karlsruhe Institute of Technology, Institute of Applied Geoscience, Germany, Frank Laboratory of Neutron Physics, Joint Institute for Nuclear Research, Russia) Strain and texture investigations on geological materials using neutron time-of-flight diffraction
4. 2016/11/25, 12:15, inż. Michał Kud oraz członkowie SKNF "Bozon" i SKNFM "Kerma" Ocena skażenia 30 lat po awarii elektrowni w Czarnobylu - sprawozdanie z wyjazdu naukowo-kulturalnego Ukraina 2016
5. 2016/11/18, 12:00, Seminarium z okazji 25-lecia Wydziału Fizyki i Informatyki Stosowanej połączone z wręczeniem Nagrody im. Prof. Antoniego Marii Hoborskiego Prof. dr. hab. Jerzemu Niewodniczańskiemu
6. 2016/11/10, 12:15, Seminarium dydaktyczne
7. 2016/11/04, 12:15, prof. dr hab. inż Wojciech Łużny (KFMS WFiIS AGH) Wyzwanie i przygoda, czyli 20 lat poszukiwań modelu struktury układu PANI/CSA

8. 2016/10/28, 12:15, dr hab. Piotr Homola (ZPK IFJ PAN) Cosmic-Ray Extremely Distributed Observatory: nowe mozliwosci badawcze w astrofizyce
9. 2016/10/21, 12:15, prof. dr hab. inż. Andrzej Zięba (KFMS WFiIS AGH) Układ okresowy pierwiastków w świetle obliczeń struktury elektronowej
10. 2016/10/14, 12:15, prof. dr hab. Jerzy Niewodniczański (WFiIS AGH) Zagrożenie bronią jądrową
11. 2016/10/07, 12:15, Seminarium dziekańskie
12. 2016/06/10, 12:15, dr inż. Łukasz Kłosowski (Instytut Fizyki UMK w Toruniu) Jony molekularne w pułapce Paula
13. 2016/06/03, 12:15, dr hab. n. med. Grzegorz Gajos (Krakówski Szpital Specjalistyczny im. Jana Pawla II) Wino, serce, mózg - zdrowie i technologia
14. 2016/05/20, 12:15, dr Grzegorz Kamiński (Laboratorium Reakcji Jądrowych, ZIBJ Dubna) Badania lekkich egzotycznych jąder w Laboratorium Reakcji Jądrowych ZIBJ w Dubnej. Praktyki dla studentów w ZIBJ
15. 2016/05/13, 12:15, dr hab. Bartłomiej Dybiec (WFAiIS UJ) Stany stacjonarne w dwuwymiarowych układach zaburzanych szumami Levy'ego
16. 2016/05/06, 12:15, Dr. Stefan Heun (NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Pisa, Italy) Scanning Gate Microscopy on low-dimensional nanostructures
17. 2016/04/22, 12:15, prof. dr hab. Janusz Adamowski (KISiFK WFiIS AGH) Spintronika - fotonika: analogie
18. 2016/04/08, 12:15, dr Renata Szymańska (KFMiB WFiIS AGH) Starzenie i długowieczność
19. 2016/04/01, 12:15, dr hab. Andrzej Kułak (Katedra Elektroniki WIEiT AGH) Fale elektromagnetyczne ELF na powierzchni Ziemi
20. 2016/03/18, 12:15, dr inż. Radosław Strzałka (KFMS WFiIS AGH) Kwazikryształy - struktura atomowa, obraz dyfrakcyjny i modelowanie
21. 2016/03/11, 12:15, dr Piotr Zieliński (Zakład Badań Materii Miękkiej IFJ PAN) Zastosowanie techniki muSR w badaniach własności magnetyków molekularnych
22. 2016/03/04, 12:15, prof. dr hab. Jerzy Niewodniczański (WFiIS AGH) Aktualna sytuacja energetyki jądrowej na świecie
23. 2016/02/26, 12:15, prof. dr hab. Janusz Adamowski (WFiIS AGH), dr hab. Renata Tokarz-Sobieraj prof. IKiFP PAN (IKiFP PAN), dr hab. Andrzej Horzela prof. IFJ PAN (IFJ PAN) Interdyscyplinarne Studia Doktoranckie 'Zaawansowane Materiały dla Nowoczesnych Technologii i Energetyki Przyszłości' - podsumowanie projektu
24. 2016/01/15, 12:15, prof. dr hab. Kvetoslava Burda (KFMiB WFiIS AGH) Zielona energia: hit czy mit?
25. 2016/01/08, 12:15, dr hab. Paweł Janowski (WFiIS AGH) Pozwól mi zrobić, a zrozumiem. O popularyzacji fizyki

Research grants
National Science Centre (NCN)

1. MAESTRO NCN 2011/02/A/ST3/00124 Badania wpływu domieszek rezonansowych i konwencjonalnych na własności termoelektryczne z uwzględnieniem efektów relatywistycznych prof. dr hab. JANUSZ STEFAN TOBOŁA 2012-04-30 2017-04-30 ”
2. 2011/02/A/ST3/00150 Oligo-atomowe supersieci metal-tlenek jako nowe materiały o dostrajalnych właściwościach elektrycznych i magnetycznych prof. dr hab. JÓZEF KORECKI 2012-04-27 2017-08-27
3. OPUS NCN 2012/05/B/ST3/03290 Modelowanie transportu ładunku w nanostrukturach półprzewodnikowych z bramką skanującą, prof. dr hab. BARTŁOMIEJ SZAFRAN from 2013-01-25 till 2016-01-24
4. OPUS NCN 2013/09/B/ST4/02951 Zastosowanie wiązki zjonizowanych klastrów gazu do profilowania głębokościowego materiałów polimerowych metodą spektroskopii fotoelektronów dr hab. ANDRZEJ BERNASIK from 2014-02-21 till 2016-02-20
5. OPUS NCN 2012/05/B/ST2/02480 Badanie dyfrakcji, fotoprodukcji i nowej fizyki z wykorzystaniem tagerów protonów w przód w eksperymencie ATLAS na LHC prof. dr hab. Janusz Jerzy Chwastowski 2013-05-16 2016-11-15
6. OPUS NCN 2013/11/B/ST3/03837 Uwięzienie elektrostatyczne oraz manipulacja stanami spinowo-dolinowymi nośników w kropkach kwantowych definiowanych w nanorurkach węglowych i dwuwarstwowym grafenie prof. dr hab. BARTŁOMIEJ SZAFRAN 2014-07-08 2017-07-07
7. OPUS NCN 2013/11/B/ST3/03787 Własności strukturalne i mechaniczne metali - od prostych struktur do złożonych stopów metali na przykładzie kwazikryształów i innych układów międzymetalicznych prof. dr hab. JANUSZ JACEK WOLNY 2014-07-16 2017-07-15
8. OPUS NCN 2012/07/B/ST2/03752 Projektowanie nowatorskich detektorów pikselowych w technologii SOI dla fizyki cząstek dr Piotr Kapusta 2013-07-25 2017-07-24
9. OPUS NCN 2015/19/B/ST2/00906 Badanie fizyki Modelu Standardowego w zderzeniach proton-proton przy energii 13 TeV prof. dr hab. Barbara Wosiek 2016-09-08 2017-09-07
10. OPUS NCN 2014/13/B/ST3/04526 Sterowane elektrostatycznie oddziaływanie spin-orbita w zastosowaniu do operacji na spinie pojedynczego elektronu (lub dziury) w nanostrukturze półprzewodnikowej. prof. dr hab. STANISŁAW KRZYSZTOF BEDNAREK 2015-02-18 2018-02-17
11. OPUS NCN 2012/07/B/ST7/01456 Projekt nowatorskiego wielokanałowego układu konwersji analogowo-cyfrowej z szybką serializacją danych, o ultra niskim poborze mocy, z wykorzystaniem zaawansowanych sub-mikronowych technologii CMOS prof. dr hab. MAREK IDZIK 2013-07-08 2018-04-07

12. OPUS NCN 2014/15/B/ST2/00175 Stan początkowy i ewolucja gorącej materii w zderzeniach proton-proton i proton-jądro na LHC dr hab. Adam Bzdak 2015-07-09 2018-07-08
13. OPUS NCN 2015/17/B/ST2/00101 Badanie czasoprzestrzennej dynamiki zderzeń jądrowych poprzez kolektywne korelacje wielocząstkowe prof. dr hab. Piotr Bożek 2016-01-25 2019-01-24
14. OPUS NCN 2015/17/B/ST2/02904 Wkład do rozwoju trygera wysokiego poziomu eksperymentu LHCb oraz przyszłościowych półprzewodnikowych systemów do precyzyjnej rekonstrukcji położenia cząstek naładowanych. dr hab. TOMASZ SZUMLAK 2016-01-25 2019-01-24
15. OPUS NCN 2015/17/B/ST3/01204 Teoretyczne i doświadczalne badanie wpływu energii formowania i temperatury na skład fazowy i własności stopów wysokiej entropii otrzymywanych nowatorską metodą dr hab. JAKUB TADEUSZ CIEŚLAK 2016-03-16 2019-03-15
16. OPUS NCN 2015/17/B/ST3/01161 Symulacje zjawisk interferencyjnych na złączach n-p indukowanych elektrostatycznie w grafenie przez sondę skanującą prof. dr hab. BARTŁOMIEJ SZAFRAN 2016-01-26 2019-08-25
17. OPUS NCN 2015/19/B/ST3/00543 Sterowalne właściwości magnetyczne nanostruktur spintronicznych na bazie stopu FeRh dr hab. TOMASZ ŚLĘZAK 2016-10-03 2019-10-02
18. OPUS NCN 2015/19/B/ST2/00989 Badanie ekskluzywnej i prawie ekskluzywnej produkcji stanów o małych masach z wykorzystaniem tagerów w przód w eksperymencie ATLAS na akceleratorze LHC. dr LESZEK Stanisław ADAMCZYK 2016-08-09 2019-10-08
19. OPUS NCN 2016/21/B/ST2/01083 Analiza zniszczeń radiacyjnych pozycjoczułych planarnych mikro-paskowych sensorów krzemowych dla fizyki wysokich energii dr AGNIESZKA MAGDALENA OBŁĄKOWSKA-MUCHA 2017-03-01 2020-02-29
20. PRELUDIUM NCN 2012/05/N/ST10/03710 Zmienność czasowa i przestrzenna podtlenku azotu w atmosferze południowej Polski: oszacowanie regionalnych stężeń oraz strumieni N2O dr Michał Gałkowski from 2013-03-06 till 2016-03-05
21. PRELUDIUM NCN 2014/13/N/ST3/03776 Badanie struktury kwazikryształów ikozaedrycznych - analiza dyfrakcyjna i modelowanie dr Radosław Zbigniew Strzałka 2015-02-12 2017-02-11 ”
22. PRELUDIUM NCN 2013/09/N/ST5/00874 Modyfikacja poziomów energetycznych złącz polimer/metal dr Mateusz Marek Marzec 2014-03-18 2017-03-17
23. PRELUDIUM NCN 2012/07/N/ST6/02192 Identyfikacja osób na podstawie tęczówki oka w zmiennych warunkach środowiskowych dr Krzysztof Misztal 2013-07-08 2017-10-07
24. PRELUDIUM NCN 2015/17/N/ST3/02282 Mikroskopia blokady kulombowskiej kropek kwantowych Elżbieta Wach 2016-02-24 2018-02-23

25. PRELUDIUM NCN 2014/13/N/ST8/00081 Badanie wpływu mikrostruktur początkowych 2D i 3D na symulacje zjawiska rekrystalizacji i rozrostu ziaren w heksagonalnym tytanie w oparciu o zaproponowany model Pottsa oraz dane EBSD. dr MARIUSZ JĘDRYCHOWSKI 2015-03-10 2018-03-09
26. PRELUDIUM NCN 2015/17/N/ST3/02266 Symulacje mikroskopii bramki skanującej dla układów dwuwymiarowych z oddziaływaniem spin-orbita. Krzysztof Kolasiński 2016-02-25 2019-02-24
27. PRELUDIUM NCN 2016/21/N/ST3/00287 Wpływ nieporządku fazonowego na obraz dyfrakcyjny struktur kwaziperiodycznych Ireneusz Józef Bugański 2017-03-02 2020-03-01
28. HARMONIA NCN 2015/18/M/ST2/00087 Badanie zderzeń ciężkich jonów w eksperymencie ATLAS przy energiach LHC dr hab. Adam Trzupek 2016-05-18 2017-05-17
29. HARMONIA NCN 2013/08/M/ST2/00320 Eksperyment ATLAS: doświadczalna weryfikacja Modelu Standardowego i poszukiwania sygnałów Nowej Fizyki przy energiach LHC prof. dr hab. Barbara Wosiek from 2013-09-26 till 2016-03-25
30. HARMONIA NCN 2013/10/M/ST2/00629 Badanie zjawiska łamania symetrii CP oraz poszukiwanie Nowej Fizyki w eksperymencie LHCb prof. dr hab. Mariusz Witek from 2014-06-13 till 2016-06-12
31. HARMONIA NCN 2013/10/M/NZ4/00268 Elektryczna stymulacja siatkówki oka z rozdzielczością pojedynczych komórek zwojowych w eksperymentalnym modelu in-vitro zaawansowanej protezy dla niewidzących dr PAWEŁ ŁUKASZ HOTTOWY 2014-05-19 2017-05-18
32. HARMONIA NCN 2015/18/M/ST2/00098 Badanie elastycznych i miękkich dyfrakcyjnych oddziaływań proton-proton z użyciem komponenty ALFA detektora ATLAS przy LHC. prof. dr hab. Janusz Jerzy Chwastowski 2016-05-12 2017-11-11
33. HARMONIA NCN 2013/10/M/ST7/00568 Rozwój detektorów pozycjoczułych opartych na technologii gazowych powielaczy elektronów w ramach projektu RD51. prof. dr hab. WŁADYSŁAW DĄBROWSKI 2014-05-14 2018-05-13
34. HARMONIA NCN 2015/18/M/ST2/00123 Badanie procesów elektrosłabych z udziałem ciężkich kwarków oraz udział w obsłudze detektora LHCb. prof. dr hab. Mariusz Witek 2016-05-23 2018-05-22
35. HARMONIA NCN 2015/18/M/ST2/00162 Badanie dyfrakcji i natury spinu protonu w oddziaływaniach protonów i ciężkich jonów w eksperymencie STAR na akceleratorze RHIC. prof. dr hab. MARIUSZ PRZYBYCIEŃ 2016-04-08 2019-04-07
36. SONATA NCN 2014/15/D/ST8/00542 Badanie własności materiałów polikrystalicznych z użyciem metody MGIXD dr Marianna Ewa Marciszko 2015-07-21 2018-01-20
37. SONATA NCN 2015/19/D/NZ9/00060 Nowe lipidy prenylowe - występowanie, biosynteza i działanie biologiczne dr hab. Renata Mariola Szymańska 2016-06-14 2019-06-13

38. SONATA NCN 2015/19/D/ST8/00818 Badanie eksperymentalne in-situ oraz modelowanie mechanizmów odkształcenia metali heksagonalnych podczas rozciągania. dr MARCIN RAFAŁ WROŃSKI 2016-07-18 2019-07-17
39. SONATA BIS 2014/14/E/ST3/00026 Sprzężenia i anizotropia magnetyczna wieloskładnikowych nanokompozytów i ferrofluidów badane technikami wysokorozdzielczej spektroskopii rentgenowskiej dr hab. MARCIN ANDRZEJ SIKORA 2015-05-27 2020-05-26
40. ETIUDA NCN 2015/16/T/ST3/00312 Stany zlokalizowane w kropkach kwantowych indukowanych elektrostatycznie w dwuwarstwowym grafenie, Dariusz Żebrowski 2015-10-01 2016-09-30 ”
41. ETIUDA NCN 2015/16/T/ST3/00264 Mikroskopia rezonansowa transportu kwantowego w grafenie Alina Maria Mreńca-Kolasińska 2015-10-01 2016-09-30 ”
42. ETIUDA NCN 2015/16/T/ST3/00310 Modelowanie mikroskopii bramki skanującej w układach otwartych z dwuwymiarowym gazem elektronowym. Krzysztof Kolasiński 2015-10-01 2016-09-30 ”
43. ETIUDA NCN 2015/16/T/ST3/00266 Dynamika przejść spinowo-dolinowych w kropkach kwantowych zdefiniowanych elektrostatycznie w nanorurkach węglowych Edyta Natalia Osika 2015-10-01 2016-09-30 ”
44. SYMFONIA NCN 2013/08/W/NZ4/00691 Kontrola i regulacja zachowań metodami neuroinżynierii prof. dr hab. ANDRZEJ ZBIGNIEW WRÓBEL 2013-12-20 2018-12-19

Grants of Ministry of Science and Higher Education (MNiSW)

1. SPUB 20.11.220.918 Stacja pomiaru składu atmosfery KASLAB na Kasprowym Wierchu prof. dr hab. KAZIMIERZ RÓŻAŃSKI 2015-06-22 2016-06-30
2. 11.11.220.01 Dotacja na utrzymanie potencjału badawczego Badania podstawowe i stosowane w dziedzinach : Fizyka i Technika Jądrowa oraz Fizyka Ciała Stałego prof. dr hab. BARTŁOMIEJ SZAFRAN 2016-01-01 2016-12-31
3. DIALOG 0047/2016 Innowacje w procedurach transferu technologii: Nauka-Przemysł prof. dr hab. ZBIGNIEW KĄKOL 2016-12-16 2018-12-15
4. DIR/PM/2016/02 Wsparcie udziału polskich zespołów naukowych w ESRF oraz CERN dr hab. TOMASZ SZUMLAK 2016-12-22 2017-01-22, Wsparcie udziału polskich zespołów naukowych w ESRF oraz CERN
5. DIR/WK/2016/16 Eksperyment LHCb przy akceleratorze LHC w CERN prof. dr hab. Mariusz Witek 2016-09-27 2020-12-31
6. DIR/WK/2016/13 Eksperyment ATLAS przy akceleratorze LHC w CERN. prof. dr hab. Barbara Wosiek 2016-08-23 2021-12-31

Grants of National Centre for Research and Development (NCBiR)

1. PBS3/A9/29/2015 Metoda nieinwazyjnego obrazowania rozkładu pierwiastków do badań dzieł sztuki prof. dr hab. WŁADYSŁAW DĄBROWSKI 2015-04-01 2018-09-30

EU grants and other foreign sources

1. BONUS-VE-2012-02/2014 Redukcja ładunków zanieczyszczeń pochodzenia rolniczego wpływających do Bałtyku poprzez wody podziemne i powierzchniowe. dr PRZEMYSŁAW JERZY WACHNIEW 2014-02-01 2018-03-31
2. 18199/RO Zastosowanie rentegenowskiej fluorescencyjnej i absorpcyjnej mikrospektroskopii z zastosowaniem promieniowania synchrotronowego w badaniach biomedycznych. prof. dr hab. MAREK WOJCIECH LANKOSZ 2014-04-04 2018-04-14
3. 633053 EUROFUSION Implementation of activities described in the Roadmap to Fusion during Horizon 2020 through a Joint programme of the members of the EUROfusion consortium prof. dr hab. STANISŁAW DUBIEL 2014-01-01 2018-12-31
4. 654168 AIDA 2020 Advanced European Infrastructures for Detectors at Accelerators prof. dr hab. MAREK IDZIK 2015-05-01 2019-04-30

Defences of PhD theses

1. 15.12.2016
   mgr inż. Artur Surówka
   "Development of analytical approaches for molecular and fully quantitative elemental micro-imaging of brain tissue with X-ray and infrared radiation"
   supervisor: dr hab inż. Magdalena Szczerbowska-Boruchowska
2. 14.12.2016
   mgr inż. Dominika Augustyńska
   "The influence of selected carotenoids on mesomorphic phase behaviour of model membranes"
   supervisor: prof. dr hab. Kazimierz Strzałka
   auxiliary supervisor: dr Małgorzata Jemioła-Rzemińska

3. 30.09.2016
   mgr inż. Magdalena Szczepanik-Ciba
   "Struktura i stechiometria metalicznych i tlenkowych warstw manganu na podłożach monokrystalicznych"
   supervisor: prof. dr hab. Józef Korecki
   auxiliary supervisor : dr Robert R. Socha

Habilitations

1. 27.06.2016
   Przemysław Gawroński
2. 23.05.2016
   Krzysztof Malarz
3. 22.03.2016
   Małgorzata Krawczyk