

INSTYTUT FIZYKI POLSKIEJ AKADEMII NAUK



Sesja sprawozdawcza z działalności naukowej w roku 2022

9 lutego 2023
początek o godzinie 9:50



Sesja sprawozdawcza z działalności
naukowej w roku 2022 – Audytorium IF PAN



**SESJA SPRAWOZDAWCZA
Z DZIAŁALNOŚCI NAUKOWEJ INSTYTUTU FIZYKI PAN
W ROKU 2022**

**REPORTING SESSION
OF RESEARCH ACTIVITIES OF THE INSTITUTE OF PHYSICS PAN
IN 2022**

9.02.2023

Audytorium IF PAN



PROGRAM

09:50 - 10:00

prof. dr hab. Roman Puźniak

Director of the Institute of Physics, Polish Academy of Sciences

Opening address

10:00 - 10:25 (ON 3)

prof. dr hab. Andrzej Szewczyk

Low-temperature magnetic phase transition in $TbAl_3(BO_3)_4$ - quantum and classical aspects

10:25 - 10:50 (ON 6)

dr hab. Carmine Autieri, prof. IF PAN

Manipulation of the Weyl points

dr Valentine Volobuiev

Spin-resolved ARPES of topological crystalline insulator $Pb_{1-x}Sn_xSe$ (111) epilayers

10:50 - 11:15 (SL 2)

prof. dr hab. Jerzy Wróbel

Quantum transport and mobility spectrum of topological carriers in (001) SnTe/PbTe heterojunctions

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mgr Yadhu Krishnan Edathumkandy

Comparative study of magnetic properties of Mn³⁺ magnetic clusters in GaN using Classical and Quantum mechanical approach

11:15 - 11:40 (SL 3)

mgr Piotr Baranowski

Carrier separation in type II quantum dots inserted in (Zn,Mg)Te/ZnSe nanowire

11:40 - 12:05 (ON 1)

dr Michał Szot

A new method of obtaining bulk PbTe-CdTe thermoelectric nanocomposite

prof. dr hab. Tadeusz Wosiński

Current-induced spin-orbit torque driven magnetization reversal in (Ga,Mn)(Bi,As) dilute ferromagnetic semiconductor

12:05 - 12:30 (ON 2)

Dr hab. Michał F. Rode

Intramolecular mechanisms in photochromic organic molecules

12:30 - 13:30 LUNCH BREAK

13:30 - 13:55 (ON 5)

dr hab. Emilia Witkowska, prof. IF PAN

Mott squeezed states with ultra-cold fermions

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13:55 – 14:20 (ON 4)

dr Marcin Stachowicz

Structural and excitonic analysis of the ZnO/MgO superlattices on a-polar ZnO substrates grown by MBE

dr Aleksandra Wierzbicka

Strain and lattice vibration mechanisms in GaN-Al_xGa_{1-x}N nanowire structures on Si substrates

14:20 – 14:45 (SL 1)

dr Serhii Kryvyi

Strain fields in nanowires - measurements using nano electron diffraction and FEM modeling

14:45 – 15:10 (SL 4)

dr Mateusz Chwastyk

Contact-based molecular dynamics of structured and disordered proteins in a coarse-grained model: Fixed contacts, switchable contacts and those described by pseudo-improper-dihedral angles

15:10 – 15:30

dr hab. Piotr Deuar, prof. IF PAN,

Deputy Director for Scientific Affairs

Summary and some statistics



SESJA PLAKATOWA
POSTER SESSION
on-site and on-line

ON 1

1. D. Kochanowska, A. Wardak, A. Mycielski, A. Reszka, A. Sulich, W. Chromiński, P. Bazarnik, M. Lewandowska,
ZnTe and (Cd,Mg)Te layers as a contact for the high-resistivity (Cd,Mn)Te crystals
2. P. Skupiński, K. Sobczak, K. Graszka, A. Reszka, A. Avdonin, Z. Adamus, M. Arciszewska, J. Sitnicka, A. Wołoś,
Three types of structures obtained from the $Mn_{\alpha}Bi_{\beta}Sb_{\gamma}Te_{\delta}$ materials family
3. A. Wardak, D. M. Kochanowska, A. Mycielski,
Compensation of (Cd,Mn)Te to Obtain High Resistivity and Mobility-Lifetime Product
4. Sania Dad, P. Dziawa, W. Zajkowska, S. Kret, M. Kozłowski, M. Wójcik, W. Pacuski, J. Sadowski,
Epitaxial Growth of Nearly Lattice Matched GaAs-Pb_(1-x)Sn_(x)Te Core-Shell Nanowires

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5. M. Zięba, K. Gas, A. Grochot, K. Dybko, A. Kazakov, V.V. Volobuev, B. Turowski, W. Zaleszczyk, W. Wołkanowicz, A. Reszka, R. Minikayev, T. Wojciechowski, H. Przybylińska, M. Sawicki, T. Wojtowicz, T. Story,
Magnetic phase diagram of $\text{Sn}_{1-x}\text{Mn}_x\text{Te}$ epitaxial layers
6. A. Khaliq, P. Dziawa, R. Minikaev, M. Arciszewska, A. Avdonin, B. Brodowska, Ł. Kilański,
Weak anti-localization effect in SnTe based epitaxial thick layers

ON 2

1. G. Derkachov, S. Alikhanzadeh-Arani, D. Jakubczyk,
Determination of the dominating forces that influence the process of self-assembly of nanoparticles in the volume of an evaporating droplet
2. G. Derkachov, K. Nyandey, S. Alikhanzadeh-Arani, A. Derkachova, D. Jakubczyk,
Simultaneous measurement of chromatic dispersion and thermal coefficients of hygroscopic liquids
3. I. Zajcewa, M. Chrobak, M. Z. Cieplak,
Coulomb blockade effect in highly underdoped LSCO thin films
4. P. Gierłowski, B. Cury Camargo, I. Abaloszewa, A. Abaloszew, M. Jaworski, K. Cho, R. Prozorov, M. Kończykowski,
Superconducting properties of electron-beam irradiated $\text{Ba}_{1-x}\text{K}_x\text{Fe}_2\text{As}_2$



5. I. Abaloszewa, M. Z. Cieplak, A. Abaloszew,
Thermomagnetic instabilities in Nb films deposited on glass substrates
6. Sameh M. Altanany, Irina Zaytseva, Roman Minikayev, Marta Z. Cieplak,
Berezinskii-Kosterlitz-Thouless transition in ultrathin niobium films
7. M. Ożga, R. Mroczyński, Piotr Sybilski, M. Godlewski, B.S. Witkowski,
Hydrothermally grown copper oxide thin films for memory applications
8. Jarosław Kaszewski, Zofia Klukowska, Bartłomiej Witkowski, Łukasz Wachnicki,
Michał Godlewski, Marek Godlewski,
*Microwave hydrothermal synthesis of ZnO:Eu, Mg nanoparticles for
supplementation of magnesium*
9. Omer Farooq, Afshin Akhshani, Małgorzata Białous, Szymon Bauch,
Michał Ławniczak, Leszek Sirko,
*Investigation of the generalized Euler characteristic of graphs and microwave
networks split at edges and vertices*
10. Olaf W. Morawski, Paweł Gawryś, Jarosław Sadło, Andrzej L. Sobolewski
Hydrogenation of Hexaazatrinaphthylene (HATN) in alcohols with visible light
11. Jacek Szczepkowski, Anna Grochola, Włodzimierz Jastrzębski,
*Study of excited electronic states of the ^{39}KCs molecule correlated with
the $K(4^2S) + \text{Cs}(5^2D)$ asymptote*



12. Leonid Shirkov

Intermolecular vibrations in the benzene-neon complex based on ab initio and SAPT potentials

ON 3

1. P. Iwanowski, A. Hruban, J. Fink-Finowicki, K. Cieślak, D. Jastrzębski, A. Wadge, R. Diduszko, M. Czech, T. Wojciechowski, A. Wiśniewski, M. Berkowski,
Growth and characterization of Weyl semimetal single crystals and single crystals of oxides for optoelectronic applications
2. A. Nabałek, Oleksandr Chumak, A. Lynnyk, J. Domagała, A. Pacewicz, B. Salski, J. Krupka, T. Yamamoto, T. Seki, K. Takanashi, L.T.Baczewski, H. Szymczak,
Anisotropy of the magnetoelastic properties in the epitaxial $\text{Co}_2\text{Fe}_x\text{Mn}_{1-x}\text{Si}$ Heusler alloys magnetic layers
3. Jaydeb Dey, Kalvig R., Jędryka E., Wójcik M., Wiedwald U., Farle M., Rosen J.,
 ^{55}Mn NMR investigations on Mn_2GaC nanolaminated thin film
4. Roger Kalvig, Jędryka E., Wójcik M., Petit M., Michez L.,
Epitaxial $\text{Mn}_5\text{Ge}_3\text{C}_x$ films – effect of carbon doping on magnetic anisotropy studied by means of ^{55}Mn NMR



5. Tatiana Zajarniuk., Szewczyk A., Gutowska M., Szuszkiewicz W., Florea O., Lhotel E., Petit S., Ressouche E., Szymczak H., Puźniak R., Prochorov A.V.,
The thermal properties and the nature of the interaction in $DyAl_3(BO_3)_4$ luminoborate of rare earths

6. Sabina Lewińska, A. Bajorek, C. Berger, M. Dulski, M. Zubko, K. Prusik, A. Ślawska-Waniewska, F. Grasset, N. Randrianantoandro,
Tuning physical properties of $NiFe_2O_4$ and $NiFe_2O_4$ coated with SiO_2 anoparticles by thermal treatment

7. Yaroslav Konopelnyk, H. Szymczak,
Different types of correlations in $Fe_{7-x}AxSe_8$ single crystals (A=Ni, Co)

8. Amar Fakhredine, Carmine Autieri, Andrzej Wawro
Huge Dzyaloshinskii-Moriya interactions in $Re/Co[n]/Pt$ thin films

ON 4

1. B.A. Orłowski, K. Gościński, K. Gwóźdź, S. Chusnutdinow, M. Galicka, E. Guziewicz, B.J. Kowalski,
Free carriers and defects interaction in illuminated photojunction

2. S.S. Haider, J. Barzowska, P. Sybilski, A. Suchocki,
Designing of experimental setup for impact induced mechanoluminescence measurements



3. Ya. Zhydachevskyy, V. Stasiv, A. Lucheckho, D. Afanassyev, J. Fink-Finowicki, S. Ubizskii, M. Berkowski, A. Suchocki,
High-Z TL/OSL detectors based on Mn-doped rare-earth aluminates

4. S. Mishra, B. S. Witkowski, R. Jakiela, Z. Khosravizadeh, W. Paszkowicz, A. Sulich, and E. Guziewicz,
Cathodoluminescence Study of Acceptor- and Donor-related Emission of ZnO/Si or ZnO:N/Si Films Annealed Under O₂ and N₂ Atmosphere

5. M. Sarwar, R. Ratajczak, V. Ivanov, S. Mishra, M. Turek, A. Wierzbicka, W. Woźniak, E. Guziewicz,
Wide-Bandgap Oxides implanted with Rare-Earth: Study of Crystal Structure Damage and Recovery

6. J. Kurek, R. Schifano, S. Gierałtowska, Ł. Wachnicki, K. Kopalko, B. Witkowski, M. Godlewski, M. Pawłowski, C. Jastrzębski,
ALD grown ZnMgO:Al on Si for photovoltaic applications: test solar cells performances for Mg content up to ~12% at

7. Anastasiia Lysak, E. Przeździecka, R. Jakiela, A. Wierzbicka, P. Dłużewski, K. Morawiec, A. Reszka, B. Witkowski, A. Adhikari, J.M. Sajkowski, A. Kozanecki,
The short period {CdO/ZnO}_m SLs grown on m-Al₂O₃ by MBE



8. K. Olszewski, J. Klosaj, A. Wierzbicka, K. Gołaszewska, M. Sobańska, Z.R. Żytkiewicz,
Plasma-assisted MBE growth of GaN nanowires on ZrN nucleation layers

9. M. Sobańska, N. Garro, K. Klosek, A. Cros, Z.R. Żytkiewicz,
Influence of Si substrate preparation on polarity of GaN nanowires grown on Si(111) by PAMBE: Kelvin Probe Force Microscopy studies

10. Oksana Volnianska, S. Mishra, I.N. Demchenko, M. Amati, L. Gregoratti, E. Guziewicz,
Electronic Structure of Acceptor Complexes in ZnO:N bulk and nanocrystals – DFT Calculations and Scanning Photoelectron Spectroscopy

11. Abinash Adhikari, Michał Szot, Anastasiia Lysak, Ewa Przeździecka,
Temperature-dependent bandgap study of Eu doped CdO thin film prepared by PA-MBE

ON 5

1. Soheil Arbabi, P. Deuar, M. Denys, R. Bennacer, Z. Che, P. E. Theodorakis,
Coalescence of Surfactant-laden Droplets

2. Luís Henrique Carnevale da Cunha, P. Deuar, Z. Che, and P. E. Theodorakis,
Liquid Thread Breakup and the Formation of Satellite Droplets

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3. Piotr Deuar, A. Ferrier, M. Matuszewski, G. Orso, M.H. Szymańska,
Full quantum dynamical description of the dissipative Bose-Hubbard model

4. T. Świsłocki, M. Gajda, M. Brewczyk, Piotr Deuar,
Spin distillation cooling of ultracold Bose gases

5. J.A. Ross, Piotr Deuar, D.K. Shin, K.F. Thomas, B.M. Henson, S.S. Hodgman, A.G. Truscott,
Survival of the quantum depletion of a condensate after release from its trap

6. Russell Kajouri, P. E. Theodorakis, P. Deuar, R. Bennacer, J. Židek, Sergei A. Egorov, and Andrey Milchev,
Unidirectional Droplet Propulsion onto Gradient Brushes Without External Energy Supply

7. Maciej Bartłomiej Kruk , P. Deuar,
Stationary, dynamic and thermal properties of flattened and elongated quantum droplets

8. Maciej Bartłomiej Kruk, K. Pawłowski, D. Hryniuk, K. Rzążewski,
Fock State Sampling Method for BEC Fluctuations

9. Michał Matuszewski , A. Opala,
Efficiency and scalability of optical neural networks



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10. King Lun Ng, B. Opanchuk, M.D. Reid, P. D. Drummond,
Fate of the False Vacuum: A finite temperature stochastic model for the simulated early universe in BEC

 11. Hung Nguyen , Mai Suan Li,
Antibody–nanobody combination increases their neutralizing activity against SARS-CoV-2

 12. Pamela Smardz, P. Krupa,
Role of disulfide bonds in proteins examined by molecular dynamics simulations

 13. Quyen Van Vu, I. Sitarik, Y. Jiang, D. Yadav , P. Sharma , S. D. Fried ,
Mai Suan Li, E. P. O'Brien,
A Newly Identified Class of Protein Misfolding in All-atom Folding Simulations Consistent with Limited Proteolysis Mass Spectrometry

 14. M. Płodzień, M. Lewenstein, Emilia Witkowska, J. Chwedeńczuk,
One-axis twisting as a method of generating many-body Bell correlations

 15. Damian Włodziński,
New approach to a small Fermi-polaron system in a harmonic trap

 16. Saeed Samadi, Rafał Rechciński and Ryszard Buczko
Topological electronic structure of twin boundaries and twinning superlattices in SnTe



ON 6

1. Alam Md Shahin,
Anomalous Hall and anomalous Nernst effect in ferromagnetic Weyl semimetal CeAlSi
2. Tanwar Pardeep Kumar,
MagTop Thermal chiral anomaly in antiferromagnetic Weyl semimetal NdAlSi
3. Wadge Ashutosh,
Crystal growth, low temperature electron transport and ARPES study of TaAs₂
4. Wadge Ashutosh,
Non-trivial surface state modification with Topological Lifshitz transition in Weyl semimetal NbP
5. Sahoo Pradosh K,
Magneto-transport studies on topological crystalline insulator SnTe thin film
6. Sidorczak Paweł,
PbTe/SnTe semiconductor heterostructures
7. Turowski Bartłomiej,
MagTop Topological Transition in Pb_{1-x}Sn_xSe (111) Epilayers Probed by Spin-Resolved ARPES



8. Kazakov Aleksandr,

Anomalous Hall Effect in (111)-oriented $\text{Sn}_{1-x}\text{Mn}_x\text{Te}$ Epilayers

9. Polaczyński Jakub,

Magnetotransport of High-Mobility Strained α -Sn Layers Grown on Insulating (001)-oriented CdTe/GaAs Substrates

10. Nguyen Minh Nguyen,

Unprotected edge modes in quantum spin Hall insulator candidate materials

11. Paul Tania,

Interplay of quantum spin Hall effect and spontaneous time-reversal symmetry breaking in electron-hole bilayers: zero-field topological superconductivity

12. Cuono Giuseppe,

Spin Hall effect and superconductivity in Nb-based A15 compounds

13. Hussain Ghulam,

Rashba spin-splitting and correlation-driven topological transition in Janus $\text{XSiGeP}_2\text{As}_2$ ($X=\text{Mo}, \text{W}, \text{V}$) monolayers

14. Ciepielewski Aleksander Sanjuan,

Transport signatures of Van Hove singularities in mesoscopic twisted bilayer graphene



15. Lau Alexander,

Universal suppression of superfluid weight by non-magnetic disorder in s-wave superconductors independent of quantum geometry and band dispersion

16. Mishra Archana,

Quantum computing with Yu-Shiba-Rusinov states in superconductors

17. Prem Sarath

Floquet spin qubits in gate-defined quantum dots coupled to a microwave cavity

18. Wysocki Marcin,

Non-Abelian Berry phase induced entanglement between qubits in QED cavity

SL 1

1. Serhii Kryvyi, Piotr Wojnar, Sławomir Kret,

Strain mapping of nano-twinned axial ZnTe/CdTe hetero-nanowires

2. D. Janaszko, P. Dziawa, J. Polaczyński, S. Kret, A. Kaleta, S. Kryvyi, S. Kurowska, B. Bilska, M. Turczyński, J., Sadowski

TEM analysis of the near-surface reactions in SnTe Nanowires



3. W. Zajkowska, H. Teisseyre, J. Sadowski, W. Pacuski, K. Fronc, M. Chojnacki, B. Kurowska, S. Kret,
Crystallization and structural properties of piezoelectric-magnetostrictive hybrid nanowires for nano magneto- electro- mechanical systems (NMEMS)
4. A. Sulich, J. Z. Domagala, W. Paszkowicz, M. Berkowski,
Defect structure characterization of LaGaO_3 , $\text{La}_{0.88}\text{Nd}_{0.12}\text{GaO}_3$ and $\text{SrAt}_{0.7}\text{La}_{0.2}\text{CaT}_{0.1}$ single crystals
5. M.T. Klepka, A. Wolska, A. Drzewiecka-Antonik, A. Maximenko,
K. Lawniczak-Jabłońska, J. Piotrowska, M. Olszak, A. Wawrzynska , A. Sirko,
Sulphur study in Arabidopsis thaliana using X-ray Absorption Spectroscopy
6. H.S. Rahimi Mosafer, W. Paszkowicz, R. Minikayev & M. Berkowski,
Crystal structure of $\text{Ca}_{10.5-x}\text{Co}_x(\text{VO}_4)_7$ solid solution at ambient and non ambient temperature
7. R. Sobierajski, P. Zalden, K. Sokolowski-Tinten, A. Olczak, C. Bressler, M. Chojnacki, P. Dłuzewski, P. Dziegielewski, A.R. Fernandez, K. Fronc, W. Gawelda, K. Georgarakis, A.L. Greer, J. Hastings, I. Jacyna, R. Kaminski, R.W.E. van de Kruijs, D. Khakhulin, D. Klinger, K. Kosyl, K. Kubicek, I. Milov, O. Liubchenko, K. Morawiec, N. Panagiotopoulos, M. Sikora, P. Sun, H. Yousef and J. Antonowicz,
Rapid structural transformations in Fe after sub-ps pulsed laser annealing



8. F. Aziz, R.Minikayev, P. Piszora, C. Baehtz and W. Paszkowicz,
High temperature behavior of indium nitride

SL 2

1. K. Das , A. Grochot , K. Gas , Y. K. Edathumkandy , E. Piskorska-Hommel , D. Hommel , H. Przybylinska , M. Sawicki , D. Sztenkiel,
Magnetic Dynamical Properties and Ferromagnetic Resonance in (Ga,Mn)N Layers
2. M. Foltyn, K. Norowski, M.J. Wyszyński, M.V. Milošević , M. Zgirski,
Sensing superconducting vortices with Dayem nanobridge
3. K. Norowski, M. Foltyn, A. Savin, M. Zgirski,
The fastest thermometer in the nanoworld
4. D. Sztenkiel,
Spin orbital reorientation transitions induced by magnetic field

SL 3

1. Piotr Baranowski, P. Wojnar, M. Szymura, N. Zawadzka, R. Paśławska, M. Wójcik, S. Chusnutdinow, G. Karczewski, T. Wojtowicz
Piezoelectric effect in ZnTe quantum dots inserted in (Zn,Mg)Te nanowire



2. Magdalena Duda, K. Sobczak, R. Minikayev, E. Dynowska, B. Sikora, Ł. Kłopotowski,
The influence of ZnS layer growth time on sensitivity of CuInS₂/ ZnS nanothermometer
3. Pushkar Joshi, M. Duda, K. Sobczak, Ł. Kłopotowski,
Energy Transfer in CuInS₂ Colloidal Quantum Dot Films through Comparative Photoluminescence Lifetime Investigations
4. Maciej Wójcik, M. Aleszkiewicz, J. Domagała, S. Chusnutdinow, G. Karczewski, P. Wojnar,
Crystal phase control of indium selenide layers grown by molecular beam epitaxy

SL 4

1. Dinh Quoc Huy Pham, Mateusz Chwastyk, Marek Cieplak,
The coexistence region in the van der Waals fluid and the liquid-liquid phase transitions
2. Midhun M. Anila, B. Różycki, M. Chwastyk,
Molecular dynamics simulations of α -synuclein aggregation
3. Midhun M. Anila, M. Chwastyk, B. Różycki,
Coarse-grained molecular dynamics of intrinsically disordered proteins



4. Izabela Kamińska, A. Wosztyl, P. Kowalik, B. Sikora, T. Wojciechowski, K. Sobczak, R. Minikayev, K. Zajdel, M. Chojnacki, W. Zaleszczyk, K. Łysiak, W. Paszkowicz, J. Szczytko, M. Frontczak-Baniewicz, W. Stryczniewicz, K. Fronc, *Synthesis and characterization of $Gd_2O_3:Er^{3+}$, Yb^{3+} doped with Mg^{2+} , Li^+ ions - effect on the photoluminescence and biological applications.*

5. Anna Borodziuk; Karolina Sulowska; Łukasz Zinkiewicz; Małgorzata Szymura; Anna Reszka; Aleksander Bogucki; Bożena Sikora; Sebastian Maćkowski; Łukasz Kłopotowski, *Excitation pathways in up-converting nanoparticles in the vicinity of silver nanowires*

6. Magdalena Duszka, Michał Rode, Anna Niedźwiecka, *Insights into acid-base properties of thiamine and its phosphate derivatives by spectroscopic and ab initio studies*