



Program & Abstracts

50th Vietnam Conference on Theoretical Physics

**HỘI NGHỊ VẬT LÝ LÝ THUYẾT VIỆT NAM
LẦN THỨ 50**



Dalat

4 - 7 August 2025

Program & Abstracts

50th Vietnam Conference on Theoretical Physics

Dalat Palace Heritage Hotel
02 Tran Phu Street,
Dalat, Lâm Đồng, Vietnam

4-7 August, 2025

Contents

Welcome Message	5
Committees	7
General Information	9
Conference Program	13
Conference Abstracts	31
List of Participants	112

Welcome Message

It is a great pleasure to welcome you in the 50th Vietnam Conference on Theoretical Physics (VCTP-50).

The VCTP-50 is organized by the Institute of Physics, Vietnam Academy of Science and Technology (IOP-VAST) under the support of the Vietnam Theoretical Physics Society (VTPS). It is sponsored by International Centre of Physics (ICP) at the Institute of Physics, VAST in Hanoi, Vietnam and Asia Pacific Center for Theoretical Physics (APCTP) in Pohang, Korea.

The VCTP, formerly known as the National Conference on Theoretical Physics (NCTP), has been an annual activity of VTPS since 1976. The VCTP is aimed to be an international conference for physicists in Vietnam, in the region and worldwide. Our mission is to foster scientific exchanges and to promote a high-standard level of research and education in Vietnam and in the South East Asia region.

This year, the VCTP conference is participated by nearly 175 participants. 10 invited talks, 35 oral and 107 poster contributions will be presented. We acknowledge the supports of the ICP conference program and the APCTP external program [APCTP-2025-E08].

We wish you enjoy the scientific atmosphere at this conference.

The Organizing Committee

Committees

Organizer

- Institute of Physics, Vietnam Academy of Science and Technology (IOP-VAST)

Organizing Committee

- Tran Minh Tien (Institute of Physics, VAST), Chair
- Trinh Xuan Hoang (Institute of Physics, VAST)
- Do Thi Huong (Institute of Physics, VAST)
- Nguyen Tuan Duy (Institute of Physics, VAST)

Program Committee

- Nguyen Huy Viet (Institute of Physics, VAST), Chair
- Phung Van Dong (Phenikaa University)
- Le Van Hoang (Ho Chi Minh City Pedagogical University)
- Nguyen The Toan (VNU University of Science, Hanoi)
- Vu Ngoc Tuoc (Hanoi University of Science and Technology)

Secretariat

- Tran Thi Thanh Mai (Institute of Physics, VAST, Hanoi)
- Chu Thuy Anh (Institute of Physics, VAST, Hanoi)

Sponsors

- International Centre of Physics (ICP), Institute of Physics, Vietnam Academy of Science and Technology
- Asia Pacific Center for Theoretical Physics (APCTP)

General Information

Conference venue

The VCTP-50 conference takes place in:

Dalat Palace Heritage Hotel
02 Tran Phu Street,
Dalat, Lâm Đồng, Vietnam

Instructions for participation

- Participation takes place at the conference site.
- Oral presenters present their talks as in a normal conference.
- Poster presenters present the posters as in a normal conference.

Instructions for speakers

The duration of a regular invited talk is 40 minutes. This includes 35 minutes for the presentation itself and 5 minutes for Q&A. The duration of a regular presentation is 25 minutes. This includes 22 minutes for presentation itself and 3 minutes for Q&A. We would appreciate it if all presenters can adhere strictly to these time limits.

Instructions for Posters

Poster should be prepared as one page of size A0 (841 mm x 1189 mm) in portrait (vertical) mode. The presenting author of the poster should be present during the poster session.

Meeting room

All sessions take place in the Le Princess & Le Royal conference room of the Dalat Palace Heritage Hotel. Please follow the direction in the lobby to go to the conference room.

Lunches

Lunches are provided for conference participants in the Dalat Palace Heritage Hotel. Lunch coupons are included in your name badge holder. Extra coupons (limited in number) may be purchased for accompanied family members at the registration desk.

Gala dinner

All offline participants are invited to the Gala dinner:

Time: 6 August 2025, from 18:30

For your family members to attend the Gala Dinner, please buy tickets from the conference secretary on 4 August.

VTPS Meeting

A regular meeting of the Vietnamese Theoretical Physics Society (VTPS) will be held on the first day of the conference.

Time: 17:30 - 18:00, Monday, 4 August 2025.

Place: Le Princess & Le Royal conference room, Dalat Palace Heritage Hotel.

VTPS Young Researcher Award

At the opening session of the conference, there will be an announcement and the delivery of the 2025 VTPS Young Researcher Award.

Program timetable

Time	Monday, 4 August	Tuesdat, 5 August		Wednesday, 6 August	Thursday, 7 August	
08:30 – 10:00	Registration (8:30) Opening (9:00) VTPS Young Researcher Award Trieu D. An (I.1) Photo Session (Chair: Tran Minh Tien)	Poster Session 1 (Chair: Trinh Xuan Hoang)		Excursion	Poster Session 2 (Chair: Nguyen Hong Quang)	
10:00 – 10:30	Coffee break	Coffee break			Coffee break	
10:30 – 12:00	Y. Morikawa (I.2) Nguyen Ngoc Linh (O.1) Nguyen Duc Long (O.2) (Chair: Jer-Lai Kuo)	N. Volchanskiy (I.5) Senaha Eibun (O.6) Lott Peter Tell (O.7) (Chair: Cao Van Son)	Ching-Ming Wei (I.6) Do Ngoc Son (O.8) Vo Khuong Dien (O.9) (Chair: Nguyen N. Linh)		Chavis Srichan (O.20) Nguyen L. T. Ngan (O.21) Nguyen H. K. Ngan (O.22) (Chair: Ngoc -Loan Phan)	Yang Zhesen (I.9) R.C.F Caballar (O.23) Dinh Thi Nguyen (O.24) (Chair: T. T. K. Nguyen)
12:00 – 14:00	Lunch	Lunch			Lunch	
14:00 – 15:30	Hoang Ngoc Long (I.3) Do Thi Huong (O.3) Tran Van Que (O.4) (Chair: Phung Van Dong)	Ngoc-Loan Phan (I.7) H. Mineo (O.10) Tran Dong Xuan (O.11) (Chair: Tran Nguyen Lan)	Ki-Seok Kim (I.8) Thanh T. K. Nguyen (O.12) H. T. M. Nghiem (O.13) (Chair: Tran Minh Tien)		Nguyen Q. Hung (I.10) Le Tan Phuc (O.25) Cao Van Son (O.26) (Chair: Le Duc Ninh)	Le Nhat Thanh (O.27) N. T. T. Nhung (O.28) Nguyen Van Thu (O.29) (Chair: Phan Van Nham)
15:30 – 16:00	Coffee break	Coffee break			Coffee break	
16:00 – 17:30	Jer-Lai Kuo (I.4) Tran Nguyen Lan (O.5) 50 th Anniversary of VTPS (Chair: Le Van Hoang)	Phung Van Dong (O.14) Tran Minh Hieu (O.15) Do Quoc Tuan (O.16) (Chair: Do Thị Huong)	Le Thu Lam (O.17) Nguyen Ba Phi (O.18) Phong H. Nguyen (O.19) (Chair: Nguyen T. Tien)		Nguyen T.B. Trang (O.30) Tran C. Minh (O.31) Luong Le Hai (O.32) (Chair: Hoang Anh Tuan)	N.-T. T. Hieu (O.33) Tung D. Nguyen(O.34) Pham N. Thanh (O.35) (Chair: Do Ngoc Son)
	VTPS Meeting (17:30)			Gala dinner (19:00)	Closing	

Acknowledgement notice

The 50th Vietnam Conference on Theoretical Physics is sponsored in part by the Asia Pacific Center for Theoretical Physics (APCTP). The APCTP kindly requests that participants acknowledge it in their work where APCTP has played a role. The number assigned to the 50th Vietnam Conference on Theoretical Physics is: [APCTP-2025-E08]. Below are some suggested templates for acknowledgment that participants may use:

- This work was initiated at the external program [APCTP-2025-E08] held at Dalat City, Vietnam.
- We thank the participants of the external program [APCTP-2025-E08] held at Dalat City, Vietnam for fruitful discussions.
- We thank APCTP, Pohang, Korea, for their hospitality during the External Program [APCTP-2025-E08], from which this work greatly benefited.

Conference Program

Monday, 4 August 2025

Opening Session

Chair: Tran Minh Tien

- | | |
|---------------|---|
| 08:30 - 09:00 | Registration |
| 09:00 - 09:10 | Opening |
| 09:10 - 09:20 | Announcement of 2025 VTPS Young Researcher Award |
| 09:20 - 10:00 | I.1 – Invited
Manifestation of laser-target symmetry breaking in high-harmonic generation:
from frequency shift to odd-even intensity modulation.
Trieu Doan An (Institute of Fundamental and Applied Sciences, Duy Tan University) |
| 10:00 - 10:10 | Photo Session |
| 10:10 - 10:30 | Coffee break |

Oral Session 1: *Condensed Matter Physics*

Chair: Jer-Lai Kuo

- | | |
|---------------|--|
| 10:30 - 11:10 | I.2 – Invited
Origin for the Colossal Permittivity in Nb-doped TiO ₂
Morikawa Yoshitada (The University of Osaka) |
| 11:10 - 11:35 | O.1 – Oral
When a defect in materials is a good thing?
Nguyen Ngoc Linh (Faculty of Materials Science and Engineering, Phenikaa University) |
| 11:35 - 12:00 | O.2 – Oral
Structure Prediction in the Search for Hydride-Based High-Temperature Superconductors
Nguyen Duc-Long (Science and Technology Advanced Institute, Van Lang University) |
| 12:15 - 14:00 | Lunch |

Oral Session 2: *Particle, Nuclear and Astrophysics***Chair: Phung Van Dong**

- 14:00 - 14:40 I.3 – Invited
Rare decay of axion to pair of photons in 3-3-1 model with Peccei-Quinn symmetry
Hoang Ngoc Long (STAI, VLU)
- 14:40 - 15:05 O.3 – Oral
 $U(1)_N$ as a common source for light fermionic dark matter and radiative neutrino masses
Do Thi Huong (Institute of Physics)
- 15:05 - 15:30 O.4 – Oral
Refining Gravitational Wave and Collider Physics Dialogue via Singlet Scalar Extension
Tran Van Que (NCTS, National Taiwan University)
- 15:30 - 16:00 Coffee break

Oral Session 3: *Condensed Matter Physics***Chair: Le Van Hoang**

- 16:00 - 16:40 I.4 – Invited
Understanding Quantum Resonance through IR spectroscopy and Ab Initio Anharmonic algorithms
Kuo Jer-Lai (IAMS, Academia Sinica)
- 16:40 - 17:05 O.5 – Oral
Quantum many-electron simulation: from correlated mean-field to quantum computing
Tran Nguyen Lan (University of Science, VNU-HCM)
- 17:05 - 18:00 VTPS meeting

Tuesday, 5 August 2025**Poster Session 1****Chair: Trinh Xuan Hoang**

- 08:30 - 10:00 P.1 – Poster
Impact of Channel Asymmetry on Thermoelectric Transport in a Two-Channel Charge Kondo System
Nguyen Hong Quang (Institute of Physics, Vietnam Academy of Science and Technology)
- 08:30 - 10:00 P.2 – Poster
Stochastic generation of magnetization in the one-dimensional Ising model exposed to Gaussian white, Brownian red, and pink noises
Villegas Paat Vladimir (Department of Physics, School of Foundational

- Studies and Education, Mapua University)
- 08:30 - 10:00 P.3 – Poster
Molecular Simulation-Assisted Aptamer Selection for Lipopolysaccharide Detection and Development of a Simple Electrochemical Aptasensor
Nguyen Hai Ly (Duy Tan University)
- 08:30 - 10:00 P.4 – Poster
Density Functional Theory Analysis of CH₄ and Its Halogenated Derivatives Adsorption Behavior on SnPb Surface for the Development of Gas Sensors
Tung Thanh Nguyen (Institute of Engineering Technology, Thu Dau Mot University)
- 08:30 - 10:00 P.5 – Poster
Metal-insulator transitions in the two-dimensional ionic Hubbard model within coherent potential approximation.
Nguyen Yen (Institute of Physics, VAST)
- 08:30 - 10:00 P.6 – Poster
Electromagnetically Induced Transparency in GaAs/InAs Quantum Wells under Magnetic Field and Phonon Interaction
Tran Cong Phong (Ton Duc Thang University)
- 08:30 - 10:00 P.7 – Poster
Tracking Diamond Tool Wear in Iron Machining with Machine Learning Simulation Study
Nguyen Trinh Bao Anh (The University of Osaka)
- 08:30 - 10:00 P.8 – Poster
Theoretical elucidation of local atomic structures and colossal permittivity properties of Nb-doped TiO₂
Dinh Ngoc Dung (The University of Osaka)
- 08:30 - 10:00 P.9 – Poster
Monte Carlo Simulation of Magnetocaloric Effects in Doped Perovskites
Nguyen Thi Phuong Thuy (Institute of Physics, VAST)
- 08:30 - 10:00 P.10 – Poster
In silico ion-gated targeting treatment of selected diseases using a stochastically-reset Ising model
Lamento-Villegas Barbarona Em-Em (Philippine Eye Research Institute, National Institutes of Health, University of the Philippines Manila)
- 08:30 - 10:00 P.11 – Poster
Boundary Effects and Symmetry Breaking in Maxwell–Chern–Simons Theory
Nguyen Huu Ha (University of Dalat)
- 08:30 - 10:00 P.12 – Poster
The universe as a Grand computational System
Matthew Stanley Leibel (NA)

- 08:30 - 10:00 P.13 – Poster
The nernst coefficient in semi-parabolic plus semi-inverse squared quantum wells under the influence of intense electromagnetic waves
Nguyen Quang Son (Air Defence-Air Force Academy)
- 08:30 - 10:00 P.14 – Poster
The transfer of quantum entanglement in a rhombic spins system
Le Duc Vinh (Tinh Gia 3 High School)
- 08:30 - 10:00 P.15 – Poster
Many-Body Effects and Velocity Renormalization in Doped Monolayer MoS₂
Le Van Tan (Van Lang University)
- 08:30 - 10:00 P.16 – Poster
Tuning electronic and magnetic properties of semiconducting silicon carbide nanoribbons using hydrogen doping: A first-principles investigation
Dang Phuc Dam (College of natural sciences, Can Tho University)
- 08:30 - 10:00 P.17 – Poster
Diverse electronic and magnetic properties of silicon-doped graphene nanoribbons: A hybrid functional study
Nguyen Duy Khanh (Institute for Computational Science and Artificial Intelligene, Van Lang University)
- 08:30 - 10:00 P.18 – Poster
Electrochemical performance study of a full-cell Lithium-ion battery using a Bi₂O₃@NaBi(MoO₄)₂ anode and LiCoO₂ cathode
Nguyen Tuan Loi (Duy Tan University)
- 08:30 - 10:00 P.19 – Poster
Study of the thermodynamic properties of SrZrO₃ perovskite by the statistical moment method
Cao Huy Phuong (Hung Vuong High School for the Gifted)
- 08:30 - 10:00 P.20 – Poster
Nghiên cứu dự đoán cấu trúc Janus hai chiều SnSO và ảnh hưởng của pha tạp kim loại chuyển tiếp lên các tính chất điện tử và từ tính của nó
Do Minh Hoat (Duy Tan University)
- 08:30 - 10:00 P.21 – Poster
The breaking of $\mu - \tau$ reflection symmetry in a $B - L$ model with $(Z_2 \times Z_4) \rtimes Z_2 (II)$ symmetry
Vo Van Vien (Tay Nguyen University)
- 08:30 - 10:00 P.22 – Poster
Electronic phase diagram of the half-filled ionic Hubbard model on the honeycomb lattice
Hoang Anh-Tuan (Institute of Physics, VAST)

- 08:30 - 10:00 P.23 – Poster
Optical Force Modulation on Monolayer Graphene in Microcavities: Graphene as a Medium vs. an Interface
Le Tri Dat (Dong Nai Technology University)
- 08:30 - 10:00 P.24 – Poster
Two dimensional Semi-Parabolic Plus Semi-Inverse Squared Quantum Well: Theoretical study of the oscillation in the quantum Ettingshausen effect at low temperature under the influence of intense electromagnetic waves.
Nguyen Dinh Nam (Department of Theoretical Physics, Faculty of Physics, VNU University of Science, Vietnam National University, Hanoi, Vietnam)
- 08:30 - 10:00 P.25 – Poster
Size and shape effects on electronic properties of CdX (X=Te, Se, and S) semiconductor nanoparticles
Ho Khac Hieu (Duy Tan University)
- 08:30 - 10:00 P.26 – Poster
Half-metal state in honeycomb lattice with defects
Nguyen Hong-Son (Trade Union University)
- 08:30 - 10:00 P.27 – Poster
This computational research delves into the electronic, magnetic, and spin transport phenomena observed in rich spin penta-PdSe₂ nanoribbons
Nguyen Hai Dang (Nam Can Tho University)
- 08:30 - 10:00 P.28 – Poster
The Debye-Callaway model for thermal conductivity calculation of black phosphorus nanoribbons
Nguyen Viet Chien (Phenikaa University)
- 08:30 - 10:00 P.29 – Poster
Design and Optimization of Multilayer Metamaterial Perfect Absorbers for Broadband Solar Energy Harvesting
Do Thi Nga (Institute of Physics, VAST)
- 08:30 - 10:00 P.30 – Poster
Collective excited states at small amplitude in neutron elastic scattering at low-energies
Do Quang Tam (University of Medicine and Pharmacy, Hue University)
- 08:30 - 10:00 P.31 – Poster
First-Principles Study of Hydrogen Cyanide Captured on M₂CO₂ (M = Sc, Ti, V) MXenes
Le Nguyen-Minh Thong (Institute for Advanced Study in Technology, Ton Duc Thang University)
- 08:30 - 10:00 P.32 – Poster
Qutrit-based simulation of collective three-flavor neutrino oscillations
Vũ Văn Hưởng (Hanoi National University Education)

- 08:30 - 10:00 P.33 – Poster
The Dimerization of the A β 42 under the Influence of the Gold Nanoparticle: A REMD Study
Ngo Son Tung (Institute for Advanced Study in Technology, Ton Duc Thang University)
- 08:30 - 10:00 P.34 – Poster
Optical transitions and Hofstadter spectra of monolayer TMDCs: a tight-binding investigation
Tran Khoi Nguyen (Department of Physics, University of Science, Vietnam National University Ho Chi Minh City)
- 08:30 - 10:00 P.35 – Poster
Regulated perturbation theory for anisotropic 2d exciton and a variable separation procedure for complicated double integrals
Le Do Dang Khoa (HCMUE)
- 08:30 - 10:00 P.36 – Poster
Dynamical Optical Absorption of a Monolayer Graphene inside an Empty Optical Microcavities
Pham Nguyen Thanh Vinh (Ho Chi Minh City University of Education)
- 08:30 - 10:00 P.37 – Poster
Two-component dark matter from a flavor-dependent U(1) extension of the standard model
Duong Van Loi (Phenikaa University)
- 08:30 - 10:00 P.38 – Poster
Effect of temperature and pressure on thermodynamic and melting properties of HP2 structure thallium metal
Nguyen Thi Hong (Hong Duc university)
- 08:30 - 10:00 P.39 – Poster
Neutrinoless double beta decay in an extended model with left-right symmetry
Dinh Nguyen Dinh (Institute of Physics)
- 08:30 - 10:00 P.40 – Poster
Controlling displacement of warp drive spaceship system using Proportional-Integral-Derivative controller
Trần Đình An (Ho Chi Minh City University of Technology and Education)
- 08:30 - 10:00 P.41 – Poster
Electronic and thermoelectric properties of WO₃ under the adsorption of volatile organic compounds: first-principle study
Phan Thi Hong Hoa (Ho Chi Minh City University of Technology)
- 08:30 - 10:00 P.42 – Poster
Light absorbed by Dirac electrons in silicene under a non-uniform magnetic field
Huynh V. Phuc (Dong Thap University)

- 08:30 - 10:00 P.43 – Poster
The Hall Effect in an infinite Semi-parabolic Plus Semi-inverse Squared Quantum wells in the presence of a Strong Electromagnetic Wave.
Bui Thi Dung (Department of Theoretical Physics, Faculty of Physics, VNU University of Science, Vietnam National University, Hanoi, Vietnam)
- 08:30 - 10:00 P.44 – Poster
Darksuite: an Algorithm for Dark-Matter Admixed Neutron Stars
Nguyen Thi Lan Anh (Phenikaa University)
- 08:30 - 10:00 P.45 – Poster
Modeling Myopia Progression through an Evolution Equation: Interactions Between Stimulus, Attention, and Eye Elasticity
Nguyễn Văn Hoa (GV)
- 08:30 - 10:00 P.46 – Poster
Interface Engineering and Electric Contact Design of two-dimensional van der Waals Heterostructure for Flexible Electronics
Nguyễn Văn Chương (Le Quy Don Technical University)
- 08:30 - 10:00 P.47 – Poster
Elucidating H₂S adsorption on activated carbon by van der Waals corrected density functional theory calculations
Nguyen Le Bao Tran (Quy Nhon University)
- 08:30 - 10:00 P.48 – Poster
Retrieving Anharmonic Interatomic Potentials from Conventional and Laser-Induced Electron Diffraction
Nguyễn Thị Hiền (Tay Nguyen University)
- 08:30 - 10:00 P.49 – Poster
Impact of nuclear reaction cross sections on primordial deuterium abundance
Dao Nhut Anh (Ho Chi Minh City University of Education)
- 08:30 - 10:00 P.50 – Poster
Emergent Localized Electronic States and Phonon Suppression in V₂WO₆: A New Class of Oxide Thermoelectric Materials
Le Nguyen Ngoc Quy (University of Science - VNUHCM)
- 08:30 - 10:00 P.51 – Poster
 $(g - 2)_{e,\mu}$ and lepton flavor violating decays in a left-right model
Nguyen Hua Thanh Nha (Van Lang University)
- 08:30 - 10:00 P.52 – Poster
Orientation asymmetry of planar molecules reflected in high-harmonic generation spectra
Trần Thành (Ho Chi Minh City University of Education)
- 08:30 - 10:00 P.53 – Poster
Studying nonclassical properties of the superposition of photon-added and

photon-subtracted single-mode displaced Fock state

Ho Sy Chuong (Dong Nai University)

08:30 - 10:00 P.54 – Poster

Investigation of thermodynamic properties of ideal classical and quantum gases in one-, two-, and three-dimensional space.

Phan Quang Sơn (University of Science, VNU-HCM)

10:00 - 10:30 Coffee break

Oral Session 4A: *Particle, Nuclear and Astrophysics*

Chair: Cao Van Son

10:30 - 11:10 I.5 – Invited

Renormalon-chain contributions to evolution kernels and two-point correlators of nonlocal quark currents

Volchanskiy Nikolay (Bogoliubov Laboratory of Theoretical Physics, JINR, Russia)

11:10 - 11:35 O.6 – Oral

Exploring CP Violation and EDM Cancellation in a Scale-Invariant g2HDM

Senaha Eibun (Van Lang University)

11:35 - 12:00 O.7 – Oral

Gravitational-Wave Signatures of the Kozai-Lidov Effect

Lott Peter Tell (Phenikaa University)

Oral Session 4B: *Condensed Matter Physics*

Chair: Nguyen Ngoc Linh

10:30 - 11:10 I.6 – Invited

Exploring structures and dynamics of materials with mobile atoms using machine-learning interatomic potential

Ching-Ming Wei (Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan)

11:10 - 11:35 O.8 – Oral

Capture, conversion, and utilization of hydrocarbon fuel from carbon dioxide: A case study

Do Ngoc Son (Ho Chi Minh City University of Technology)

11:35 - 12:00 O.9 – Oral

Tunable Thermal Transport in Hole-Doped Monolayer Penta-Graphene: A First-Principles and Machine Learning Study

Vo Khuong Dien (FPT University, Can Tho Campus)

12:00 - 14:00 Lunch

Oral Session 5A: *Molecular Physics, Quantum Optics and Quantum Information*

Chair: Tran Nguyen Lan

14:00 - 14:40 I.7 – Invited

Terahertz-Assisted High-Order Harmonic Generation for Waveform Sampling and Coherent XUV Emission

Phan Ngoc-Loan (Ho Chi Minh City University of Education)

14:40 - 15:05

O.10 – Oral

Theoretical study of a quantum control to create the photon-dressed states using pump lasers

Mineo Hirobumi (Van Lang University)

15:05 - 15:30

O.11 – Oral

Quantum Batteries VS Lithium-ion battery

Tran Dong Xuan (Duy Tan University)

Oral Session 5B: *Condensed Matter Physics*

Chair: Tran Minh Tien

14:00 - 14:40

I.8 – Invited

Dual holography from a non-perturbative generalization of the Wilsonian RG framework

Ki Seok Kim (POSTECH)

14:40 - 15:05

O.12 – Oral

Thermoelectric transport in some charge Kondo circuits: Generalized Cutler-Mott relation

Nguyen Thi Kim Thanh (Institute of Physics, VAST)

15:05 - 15:30

O.13 – Oral

TDNRG approach to work distributions for quantum impurity systems

Nghiem Hoa (Phenikaa University)

15:30 - 16:00

Coffee break

Oral Session 6A: *Particle, Nuclear and Astrophysics*

Chair: Do Thi Huong

16:00 - 16:25

O.14 – Oral

Towards a dark grand unification

Phung Van Dong (Phenikaa University)

16:25 - 16:50

O.15 – Oral

Type-I two Higgs doublet model: current data fitting and future detection ability

Tran Minh Hieu (Hanoi University of Science and Technology)

16:50 - 17:15

O.16 – Oral

Dimensional reduction issue of a six-dimensional Kaluza-Klein theory

Do Quoc Tuan (Phenikaa University)

Oral Session 6B: *Condensed Matter Physics*

Chair: Nguyen Thanh Tien

16:00 - 16:25

O.17 – Oral

Understanding the mechanism of the co-doping effect on ionic conductivity of Gd^{3+} and M^{3+} ($M = Nd, Pr$) co-doped ceria for solid oxide fuel cell applications

Le Thu Lam (Tay Bac University)

16:25 - 16:50 O.18 – Oral

Phase transitions in Hatano–Nelson lattice chains with periodically modulated disorder

Nguyen Ba Phi (Mientrung University of Civil Engineering)

16:50 - 17:15 O.19 – Oral

First-order magnetic transition and giant magnetic entropy change induced by random anisotropy in external fields

Nguyen Hai Phong (University of Science, Vietnam National University)

Wednesday, 6 August 2025

08:00 - 16:00 Excursion

19:00 - 21:00 Gala dinner

Thursday, 7 August 2025

Poster Session 2

Chair: **Nguyen Hong Quang**

08:30 - 10:00 P.55 – Poster

A renormalizable neutrino mass model with $(Z_2 \times Z_4) \rtimes Z_2$ (II) symmetry

Trần Đình Thám (Trường Đại học Phạm Văn Đồng)

08:30 - 10:00 P.56 – Poster

The effect of oxygen vacancy concentration on structural, electronic and optical properties of Bi_2WO_6 photocatalyst: DFT study

Doan Thi Hien (Hanoi National University of Education)

08:30 - 10:00 P.57 – Poster

Modeling Gravitational Wave Signatures from Magnetars Using Generally-Relativistic Magnetohydrodynamic Simulations

Nguyen Thi Thao Trang (Phenikaa University)

08:30 - 10:00 P.58 – Poster

Solving bound and scattering problems using symmetric matrix techniques

Nguyen Gia Huy (Ho Chi Minh City University of Education (HCMUE), Ho Chi Minh City)

08:30 - 10:00 P.59 – Poster

Reflection coefficient of a superconducting artificial atom coupled to a mirror

Tran Thi Thanh Huyen (Hanoi National University of Education)

P.64 – Poster, VCTP-50

Thermal fluctuations and mass imbalance impacts on excitonic-polaritonic condensation in a microcavity

Do Thi Hong Hai (1), Nguyen Thi Hau (1,2), Phan Van Nham (3)

(1) Hanoi University of Mining and Geology;

(2) Graduate University of Science and Technology, Vietnam Academy of Science and Technology;

(3) Duy Tan University

Signatures of the excitonic-polaritonic condensates affected by thermal fluctuations in an electron-hole mass imbalance optical microcavity are inspected. In the framework of the unrestricted Hartree-Fock approximation, a two-band electronic model with matter-light coupling is solved and we find a set of self-consistent equations specifying the excitonic and photonic condensate order parameters. Numerical results reveal a complex competition between the instabilities of the excitonic, polaritonic and photonic condensation states under the influence of the electron-hole mass imbalance and the thermal fluctuations. The distinctive features of excitonic-polaritonic-photonic condensates are also characterized by the momentum distributions of the electron-hole pair amplitude and the photonic density.

Presenter: Do Thi Hong Hai

P.65 – Poster, VCTP-50

Molecular Simulation of Noble Gas Fractionation in CO₂-Water Systems under Geological Conditions

Tu Khai Nam Nguyen (1), Huy Tien Truong (1), Magali Pujol (3), Galliero Guillaume (3), Hai Hoang (1)

(1) Institute of Fundamental and Applied Sciences, Duy Tan University, Tran Nhat Duat Street, District 1, Ho Chi Minh City, Vietnam;

(2) TotalEnergies, CSTJF, Avenue Larribau, Pau, 64018, France;

(3) Laboratoire des Fluides Complexes et leurs Réservoirs, Université de Pau et des Pays de l'Adour, E2S UPPA, CNRS, 64000, Pau, France

Abstract: Understanding the fractionation of noble gases in CO₂-H₂O equilibrium systems is crucial for their application as geochemical tracers in geological carbon storage and subsurface fluid processes [1]. However, both accurate data and a comprehensive molecular-level understanding of noble gas partitioning under relevant geological conditions remain limited [2]. In this study, we investigate the equilibrium fractionation of noble gases between CO₂ and water phases using Gibbs ensemble Monte Carlo (GEMC) simulations, combined with the continuous fractional component approach [3]. Carbon-dioxide, water, and noble gases (He, Ne, Ar, Kr, Xe) molecules are described using the TraPPE, TIP4P/2005, and spherical Lennard-Jones force fields, respectively [4-6]. Unlike interaction parameters are systematically adjusted to reproduce available experimental solubility data [2, 3]. Extensive GEMC simulations are performed over a wide range of thermodynamic conditions relevant to deep subsurface reservoirs. We systematically analyze effects of temperature and pressure on noble gas fractionation induced by solubility, providing molecular-level insight into partitioning processes in CO₂-H₂O equilibrium systems.

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Presenter: Nguyen Tu Khai Nam

P.66 – Poster, VCTP-50

Interfacial Tension of Carbon Dioxide – Water: A Molecular Simulation Study

Ngoc Mai Phuong Nguyen (1,2), Tu Khai Nam Nguyen (2), Van Hoa Nguyen (2), Galliero Guillaume (3), Hai Hoang (2)

(1) School of Information Technology, Tan Tao University, Long An, Vietnam;

(2) Institute of Fundamental and Applied Sciences, Duy Tan University, Tran Nhat Duat Street, District 1, Ho Chi Minh City, Vietnam;

(3) Laboratoire des Fluides Complexes et leurs Réservoirs, Université de Pau et des Pays de l'Adour, E2S UPPA, CNRS, 64000, Pau, France

The interfacial tension (IFT) between CO₂ and water plays a key role in governing capillary trapping, fluid migration, and plume stability during subsurface CO₂ storage and utilization processes [1]. Accurate prediction of CO₂-water IFT is essential for modeling multiphase flow in porous media and assessing storage security. In this study, molecular dynamics (MD) simulations are employed to compute CO₂-water IFT over a wide range of thermodynamic conditions. The TraPPE force field is used to model CO₂, and the TIP4P/2005 model is adopted for water, as these force fields are known to reproduce the thermophysical properties of pure phases with high accuracy [2-3]. The unlike interaction parameters are adjusted to match experimental Henry's law constant of CO₂ in water [4]. The dependence of IFT on temperature and pressure is analyzed, particularly across the critical point of CO₂ [5]. In addition, the simulation results are employed to verify scaling laws for the IFT.

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Presenter: Nguyen Ngoc Mai Phuong

P.67 – Poster, VCTP-50

Influence of Parameters on Structure, Phase Transitions, and Crystallization Processes of NiMn Alloys

Mai Van Dung (1)

(1) Thu Dau Mot University, 6 Tran Van On Street, Phu Hoa Ward, Thu Dau Mot City, Binh Duong Province, 75000, Vietnam

In this study, we examine the influence of heating rate, atomic numbers, annealing time, and temperature on the structure, phase transitions and crystallization processes of NiMn alloys using molecular dynamics simulations with periodic boundary conditions. The structural characteristics, phase transition, and crystallization behavior are quantitatively evaluated using several analytical approaches, including the radial distribution function (RDF), total system energy (E_{tot}), particle size (D), and Common Neighborhood Analysis (CNA). Changes in structural unit distributions—such as Face-Centered Cubic (FCC), Hexagonal Close-Packed (HCP), Body-Centered Cubic (BCC), and Other phases—are observed in response to variations in input parameters.

Presenter: Mai Van Dung

P.68 – Poster, VCTP-50

First-principles insights into electron–phonon scattering limited mobility in two-dimensional Janus materials

Nguyen T. Hiep (1), Le V. Hung (2), Nguyen V. Chuong (3), Nguyen N. Hieu (1)

(1) Duy Tan University, Da Nang, Vietnam;

(2) University of Education, Hue University, Hue, Vietnam;

(3) Le Quy Don Technical University, Ha Noi, Vietnam

Two-dimensional (2D) materials are emerging as key candidates for next-generation electronic devices. To assess their application potential, it's crucial to accurately determine their carrier mobility, which is governed by electron-phonon scattering processes. Our research utilizes density functional theory (DFT) calculations to determine carrier mobility in several 2D Janus materials, taking into account various phonon scattering mechanisms. We have successfully identified the dominant scattering mechanisms that significantly impact mobility, thereby shedding light on the electronic transport characteristics of these materials.

Presenter: Nguyễn Ngọc Hiếu

P.69 – Poster, VCTP-50

BCS–BEC crossover of the equilibrium excitonic-polaritonic condensates in the mass imbalance optical microcavities

Thi-Hau Nguyen (1,2), Thi-Hong-Hai Do (2) and Van-Nham Phan (3)

(1) Graduate University of Science and Technology - Vietnam Academy of Science and Technology;

(2) Department of Physics, Hanoi University of Mining and Geology, Duc Thang, Bac Tu Liem, Hanoi, Vietnam;

(3) Institute of Research and Development, Duy Tan University, 3 Quang Trung, Danang, Vietnam

Electron-hole mass imbalance and Coulomb interaction impacts on the BCS–BEC crossover of

the excitonic-polaritonic condensation states in the equilibrium optical semiconducting microcavities are examined. Within the unrestricted Hartree-Fock framework applied to a two-band electronic system incorporating both the electron-hole Coulomb attraction and light-matter coupling on an equal footing, the polaritonic condensate order parameter is selfconsistently solved. The excitonic and photonic susceptibilities evaluated by the random phase approximation specify the phase boundaries of the excitonic-polaritonic-photon condensate structures. Analyzing the momentum distributions of the electron-hole pair amplitude and photonic density shows us the complex BCS-BEC crossover of the condensation states. The phase diagram indicates significant roles of the Coulomb interaction and mass imbalance on the stabilities of the excitonic-polaritonic condensation states in the equilibrium optical microcavities.

Presenter: Nguyen Thi Hau

P.70 – Poster, VCTP-50

Impact of laser parameters on photoisomerization probability in hydrogen cyanide

Le Viet Nam (1), Trieu Doan An (2), Phan Thi Ngoc Loan (1)

(1) Department of Physics, Ho Chi Minh City University of Education, Ho Chi Minh City, Vietnam;

(2) Institute of Fundamental and Applied Sciences, Duy Tan University, Ho Chi Minh City, Vietnam

Laser-driven control of the isomerization process of the hydrogen cyanide (HCN) molecule has attracted attention due to its potential to enhance the formation yield of HNC isomer. Previous studies showed that two-color lasers – combinations of two lasers with different frequencies, can significantly enhance the isomerization probability compared with one-color laser. However, the influence of individual laser parameters remains insufficiently explored. In this study, we extend the investigation to clarify the influence of various laser parameters on the isomerization probability. Specifically, we examine the effects of intensity, pulse duration, and direction of laser polarization for one-color laser, and of intensity and relative phase for two-color lasers. To simulate the interaction of the HCN molecule with a laser field, we firstly calculate the potential energy surface (PES) using the Complete Active Space Self-Consistent Field method via the ORCA program. The isomerism process is simulated by numerically solving the time-dependent Schrödinger equation for the motion of hydrogen nucleus in the effective potential of PES and laser-molecular dipole coupling. The results reveal the specific regions of laser parameters for optimizing the isomerization probability. Remarkably, in high-probability cases, we observe the tunneling and interference effects in the nuclear wavefunction. The project is ongoing with indication of these effects in measurable signals.

Presenter: Lê Viết Nam

P.71 – Poster, VCTP-50

Study and design organic semiconductor materials with outstanding properties using New quantum computing methods

Tran Tri Nhan, Tran Nguyen Lan

VNUHCM - University Of Science,

In the field of organic light-emitting diodes (OLEDs), the recombination of charge carriers gen-