TIMETABLE

29th May 2020	
08h30-09h00	Registration Welcome and Workshop Opening Remarks
	Chair: Pham Thanh Phong Co-chair: Nguyen Duy Vy
09h00-09h30	**Oral 01:** Hirobumi Mineo (AIMaS – Ton Duc Thang University)
09h30-10h00	**Oral 02:** Hieu T Nguyen-Truong (AIMaS – Ton Duc Thang University)
10h00-10h30	Coffee break
10h30-11h00	**Oral 03:** Khiem Hong Phan (University of Science, Vietnam National University)
11h00-11h30	**Oral 04**: Dai-Nam Le (AIMaS – Ton Duc Thang University)
11h30	Lunch
	Chair: Hirobumi Mineo Co-chair: Nguyen Truong Thanh Hieu
13h30-14h00	**Oral 05**: Eibun Senaha (AIMaS – Ton Duc Thang University)
14h00-14h30	**Oral 06:** Nguyen Duy Vy (AIMaS – Ton Duc Thang University)
14h30-15h00	Coffee break
15h00-15h30	**Oral 07:** Tri Dat Le (AIMaS – Ton Duc Thang University)
15h30-16h00	**Oral 08:** Minh-Tri Nguyen-Le (AIMaS – Ton Duc Thang University)
16h00-16h30	**Oral 09:** Minh-Loc Bui (Ho Chi Minh City University of Education)
16h30	Closing ceremony

PRESENTATIONS

PHOTOIONIZATION OF MOLECULES BY USING HIGH POWER LASER

Hirobumi Mineo

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Abstract

In recent years the application of high-power laser to ionize and dissociate molecules has attracted considerable attention, we have theoretically studied ionization-dissociation of ketone molecules using the femto-second laser. The Keldysh-Faisal-Reiss theory have been applied to calculate the ionization yields of molecular ions in the sequential ionization processes. Dissociative channels for molecular ions are also studied by the ab initio quantum chemical calculations of potential energy surfaces, and the statistical RRKM theory which can micro-canonically calculate the dissociative rate constants of the ions.

Concerning molecular ion yields, ` fragments which cannot be explained only by a thermally induced dissociation, i.e., H atom peak appears in our calculated mass spectra at high intensity I>1014 W/cm2. This is considered to be explained by the Field-Assisted-Dissociation (FAD) mechanism. In this work we estimate dissociation probabilities of molecular ions quantitatively by using the KFR theory.

LOW-ENERGY ELECTRON INELASTIC MEAN FREE PATH IN MATERIALS

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Abstract

The electron inelastic mean free path (IMFP) is an important material parameter for quantitative analyses of surfaces and thin films by electron spectroscopy and microscopy. For decades, experimental methods, theoretical models, and empirical/analytical formulas have been studied for determining IMFPs. In recent years, the IMFPs for energies below 100 eV have been attracting considerable attention due to their important role for investigating surface electronic structure of materials. Here, we present an overview of the recent development in the determination of low-energy IMFPs.

Oral 3: Khiem Hong Phan

FEYNMAN ONE-LOOP INTEGRALS IN ARBITRARY SPACE-TIME DIMENSION AND ITS APPLICATIONS

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Abstract

We present a new method for evaluating one-loop Feynman integrals in general d-dimension in this talk. The calculations are considered all external kinematic configurations and internal mass assignments. Analytic formulas are expressed in terms of generalized hypergeometric series such as Gauss 2_F_1, Appell F_1 and Lauricella F_S functions. As applications of this method, one-loop contributing to Higgs decay to di-photon, Z photon are also discussed in this talk.

References:

1. Khiem Hong Phan et al, Phys.Lett.B 791 (2019) 257-264.
2. Khiem Hong Phan, Eur.Phys.J.C 80 (2020) 5, 414.
3. Khiem Hong Phan, Dzung Tri Tran, PTEP: 10.1093/ptep/ptaa061.

GRAPHENE UNDER UNIAXIAL INHOMOGENEOUS STRAIN AND AN EXTERNAL ELECTRIC FIELD: LANDAU LEVELS, ELECTRONIC, MAGNETIC AND OPTICAL PROPERTIE

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Abstract

We investigate graphene under an inhomogeneous uniaxial strain and an in-plane electric field. We examine in detail the effect of strain and the electric field on relativistic Landau levels, Hall conductivity, de Haas-van Alphen oscillation and optical conductivity. Using Lorentz transformation in combination with supersymmetric quantum mechanics, we examine three different structures of Landau levels induced by three different profiles of inhomogeneous uniaxial strain and external electric fields. It is shown that strain-induced pseudomagnetic field forms Landau levels while electric field opposes formation of these levels. Besides the collapse of strain induced Landau levels, the influences of electric field on the quantization of strain dependent valley Hall conductivity, de Haas-van Alphen quantum oscillation of magnetization as well as optical conductivity have been investigated.

References:

[1] Dai-Nam Le, Anh-Luan Phan, Van-Hoang Le, Pinaki Roy *; Spherical fullerene molecules under the influence of electric and magnetic fields, Physica E: Low dim. syst. nanostruct. 107, 60 (2019).
[2] Dai-Nam Le, Van-Hoang Le, Pinaki Roy *; Electric field and curvature effects on relativistic Landau levels on a pseudosphere, J. Phys.: Condens. Matt., 31, 305301 (2019).
[3] Anh-Luan Phan, Dai-Nam Le *, Van-Hoang Le, Pinaki Roy; The influence of electric field and geometry on relativistic Landau levels in spheroidal fullerene molecules, Physica E: Low. dim. syst. nanostruct., 114, 113639 (2019).
[4] Dai-Nam Le, Anh-Luan Phan, Van-Hoang Le, Pinaki Roy *; Relativistic Coulomb problem in curved spaces, EPL., 127, 10005 (2019).
[5] Dai-Nam Le*, Van-Hoang Le, Pinaki Roy*; Graphene under uniaxial inhomogeneous strain and an external electric field: Landau levels, electronic, magnetic and optical properties, Eur. Phys. J. B , submitted from 30-Apr-2020

Oral 5: Eibun Senaha

ELECTRON ELECTRIC DIPOLE MOMENT AS A PROBE OF THE MATTER-ANTIMATTER ASYMMETRY OF THE UNIVERSE

Kaori Fuyuto[1], Wei-Shu Hou[2], and Eibun Senaha[3,4]

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Abstract

From cosmological observations, it is known that there exists the asymmetry between the amount of matter and that of antimatter in our Universe. Despite the great success of the standard model in particle physics, this cosmological issue is still open and new physics is called for. After the discovery of the Higgs particle in 2012, much attention has been paid to a scenario based on Higgs physics in which the asymmetry is generated by thermal phase transition. However, this scenario is now in jeopardy due to a null result of an electric dipole moment (EDM) of the electron set by ACME Collaboration in 2018.

In this talk, we elucidate a build-in cancellation mechanism for the electron EDM in a model augmented by second Higgs doublet field. Our analysis shows that the unprecedented improvement by ACME may indicate the presence of new electron Yukawa coupling constant that invokes the exquisite cancellation among the dangerous contributions, broadening the parameter space of matter-antimatter asymmetry generation driven by an extra top Yukawa coupling. We point out that the cancellation mechanism can be at work when the new Yukawa couplings have hierarchical structures that mirror the observed pattern of the standard model Yukawa couplings.

References:

[1] Kaori Fuyuto, Wei-Shu Hou, and Eibun Senaha, Physical Review D 101, 011901(R) (2020)

[2] Kaori Fuyuto, Wei-Shu Hou, and Eibun Senaha, Physics Letters B 776 (2018) 402-406

HEATING AND COOLING EFFECTS ON AN OPTOMECHANICAL OSCILLATOR BY A SQUEEZED VACUUM

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Abstract

Squeezed light is a promising factor to enhance the sensitivity of several detectors based on optomechanical effects. Recently, the possibility of using the squeezed field in the cooling of an optomechanical oscillator has received intense interest and it has been shown that this field could cool the oscillator below the standard limit of a coherent field. In this talk, the effect of the squeezed light was clarified by explicitly presenting the role of squeezing parameters on the final effective temperature of the oscillator. The results show that the cooling and heating effects are strongly dependent on the squeezing parameter and phase. The lowest effective temperature and quantum number of three orders of magnitude smaller than that in the case of no squeezing can be obtained. The study gives important information for optimizing the cooling efficiency with squeezed light.

EFFECT OF THE OVERHANGING GEOMETRY FACTORS TO COUPLING STRENGTH IN COUPLED MICROCANTILEVERS

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Abstract

Two coupled microcantilevers are used to detect small mass absorption. The overhanging part is the coupled structure which locates between two microcantilevers. In previous studies, the coupling can result in the greater magnitude of the relative change of eigenstates and eigenfrequencies than the single microcantilever. In this work, we show that geometry factors of overhang, which are the length and width, can influence the coupling rate. The obtained results show that the coupling strength is exponentially decreased with the width of overhang and that is increased linearly for the length. This can contribute to measuring and fabricating in coupled microcantilevers to ultrasensitive mass sensing.

Oral 8: Minh-Tri Nguyen-Le

SYNTHESIS OF G-C3N4/ GRAPHENE QUANTUM DOTS HYBRID PHOTOCATALYST FOR PHOTOCATALYTIC REDUCTION OF CO2 INTO SOLAR FUELS

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Abstract

The artificial photosynthesis using photocatalysts to convert CO2 into useful solar fuels is a promising means of sustainable energy-oriented use. The search for suitable semiconductors as photocatalysts for CO2 conversion using solar energy is a desirable target of material science. Recently, graphitic carbon nitrides (g-C3N4), a metal-free photocatalyst, has received much attention for practical application of CO2 photocatalytic reduction due to its features of low-cost, easy preparation process, good stability and suitable electronic structure. However, low adsorption of CO2, high recombination rate of photo-induced charge carriers and low light utilization result in low photocatalytic CO2 performance. Herein, we reported a synthesis of a metal-free g-C3N4/ graphene quantum dots hybrid photocatalyst for photocatalytic CO2 reduction into solar fuels.

References:

[1] Kang, P., Chen, Z., Nayak, A., Zhang, S. & Meyer, T. J. Single catalyst electrocatalytic reduction of CO2 in water to H2 + CO syngas mixtures with water oxidation to O2. Energy Environ. Sci. 2014. 7, 4007–4012.

[2] Hsu, H. C.; Shown, I.; Wei, H. Y.; Chang, Y. C.; Du, H. Y.; Lin, Y. G.; Tseng, C. A.; Wang, C.H.; Chen, L. C.; Lin, Y. C.; Chen, K. H., Graphene Oxide as A Promising Photocatalyst for CO2 to Methanol Conversion. Nanoscale 2013. 5, 262-268.

NUCLEAR TWO-STEP CHARGE-EXCHANGE PROCESSES

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Abstract

The study of nuclear double charge-exchange reactions with heavy-ions in recent years usually is discussed in the context of the neutrinoless double-beta decay. However, double charge-exchange reactions are a new tool in the study of two-step processes. Properties of the nuclear two-step charge-exchange excitations were studied in detail within the configuration-interaction shell model. Neon isotopes were chosen in the study because of the completeness and simple of the sd-model space. The total strength distributions were shown in the results. The role of intermediate states was observed clearly in the calculations.