A3F-CNS Summer School 2021

Report of Contributions

Contribution ID: **1** Type: **not specified**

Excitation of isobaric analog states from (p,n) and (3He,t) charge-exchange reactions within the G-matrix folding method

Wednesday, 18 August 2021 15:30 (15 minutes)

Differential cross sections of (p,n) and (3He,t) charge-exchange reactions leading to the excitation of the isobaric analog state (IAS) of the target nucleus are calculated with the distorted wave Born approximation. The G-matrix double-folding method is employed to determine the nucleus-nucleus optical potential within the framework of the Lane model. G matrices are obtained from a Brueckner-Hartree-Fock calculation using the Argonne Av18 nucleon-nucleon potential. Target densities have been taken from Skyrme-Hartree-Fock calculations which predict values for the neutron skin thickness of heavy nuclei compatible with current existing data. Calculations are compared with experimental data of the reactions (p,n)IAS on 14C at Elab = 135 MeV and 48Ca at Elab = 134 MeV and Elab = 160 MeV, and (3He,t)IAS on 58Ni, 90Zr, and 208Pb at Elab = 420 MeV. Experimental results are well described without the necessity of any rescaling of the strength of the optical potential. A clear improvement in the description of the differential cross sections for the (3He,t)IAS reactions on 58Ni and 90Zr targets is found when the neutron excess density is used to determine the transition densities. Our results show that the density and isospin dependences of the G matrices play a non-negligible role in the description of the experimental data.

Experimental nuclear physics

Theoretical nuclear physics

1

Primary author: PHAN, Nhut Huan (Institute of Fundamental and Applied Sciences, Duy Tan University)

Presenter: PHAN, Nhut Huan (Institute of Fundamental and Applied Sciences, Duy Tan University)

Session Classification: Young Scientist Session 3

Contribution ID: **2** Type: **not specified**

EFFECT OF LEVEL DENSITY PARAMETER IN THE DECAY DYNAMICS OF $^{12,13}C +^{12} C$ REACTIONS

Wednesday, 18 August 2021 15:45 (15 minutes)

The decay for number of compound nuclei formed in low energy heavy ion reactions have been successfully studied using dynamical cluster decay model (DCM) [R. K. Gupta, W. Scheid, C. Beck et al., Phys. Rev. C {68} (2003) 014610]. In a previous study the decay of $^{24,25}Mg^*$ compound nuclei (CN) for the experimentally observed intermediate mass fragments (IMFs) that are ^{6,7}Li and ^{7,8,9}Be have been explored [Rupinder Kaur, Sarbjeet Kaur et al., Phys. Rev. C {101} (2020) 034614.] within DCM. The role of the α-cluster structure of the complementary fragments was explored, which results in the enhanced preformation probability (ΣP_0) with respect to other fragments. These enhanced ΣP_0 values accordingly affect the yields of the respective IMF. In the present approach of DCM, we have extended this work to study the effect of level density parameter on the clustering effects of compound systems $^{24,25}Mg^*$ formed via respective entrance channels namely $^{12}C +^{12} C$ and $^{13}C +^{12} C$, within the collective clusterization approach of Quantum Mechanical Fragmentation Theory (QMFT). The fragmentation and preformation profiles with the inclusion of level density parameter have been compared with the previous work at critical l value and for both the spherical and deformed configurations. The investigations show that by including modified level density parameter fragmentation profile, preformation profile and penetrability (P) are modified with small changes. But there is no major change in there cross section ratios. There is decrease in ΣP_0 but the enhancement in P accordingly affects the yields of the respective fragment. The calculated ratios of ΣP_0 of the IMFs show the trend of ratio of experimental cross sections and are in fair agreement with the experimental data [S. Manna, T. K. Rana, C. Bhattacharya et al., Phys. Rev. C {94} (2016) 051601(R)].

Experimental nuclear physics

Theoretical nuclear physics

1

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Presenter: Ms KAUR, Sarbjeet (Sri Guru Granth Sahib world University)

Session Classification: Young Scientist Session 3

Contribution ID: **3** Type: **not specified**

Evolution of shell structure in neutron rich Cu and Ni nuclei

Wednesday, 18 August 2021 16:00 (15 minutes)

The evolution of shell structure with neutron and proton excess is a compelling interest in nuclear physics over the decade. The existence of the single-proton (single-neutron) shifts is well known experimentally in a series of isotopes (isotones) [1]. Although shell gaps, defined within a given theoretical framework as differences of effective single particle energies (ESPE), are not observables, they are useful quantities to assess the underlying structure of nuclei [2]. The nucleon-nucleon (NN) interaction is originally due to meson exchange processes as predicted by Yukawa, and its tensor-force part is one of the most distinct manifestations of this meson exchange origin [3]. The introduction of tensor force improved the systematic agreement between model predictions and experimental data in the shell evolution of exotic nuclei, and also the spin-orbit splitting [4]. A region of experimental interest nowadays is around the magic numbers Z=28 and N =50, where measurements of the decay properties in Co, Ni, Cu and Zn reveal the magic character of the nucleus 78Ni. The experimental results in Cu isotopes suggest that the crossing between the 2p3/2 and 1f5/2 proton levels take place in the nucleus 75Cu, which implies that the ground-state of 79Cu has spin-parity 5/2- [2]. It has been examined using different mean-field interactions such as Skyrme, Gogny and SEI-interactions that the tensor interaction may not always be necessary to reproduce the crossing between the 2p3/2 and 1f5/2 single-particle proton levels in neutron-rich Cu and Ni isotopes.

References

[1] N. A. Smirnova, et al *Physical review* C **69**, 044306 (2004).
[2] L. Olivier et al, *Phys. Rev. Lett.* **119**, 192501 (2017).
[3] T. Otsuka et al, *Phys. Rev. Lett.* **95**, 232502 (2005).
[4] L. Guo et al, *Physics Letters B* **782** (2018) 401405.

Experimental nuclear physics

Theoretical nuclear physics

1

Primary authors: Ms BANO, Parveen (School of Physics, Sambalpur University); Prof. ROUTRAY, T. R. (School of Physics, Sambalpur University); Dr ANGUIANO, M. (Departamento de Física Atómica, Molecular y Nuclear, Universidad de Granada); Dr CENTELLES, M. (Departament de Física Quàntica i Astrofísica and Institut de Ciències del Cosmos (ICCUB), Facultat de Física, Universitat de Barcelona); Dr NAIK, Z. (School of Physics, Sambalpur University); Prof. VIÑAS, X. (Departament de Física Quàntica i Astrofísica and Institut de Ciències del Cosmos (ICCUB), Facultat de Física, Universitat de Barcelona); Prof. ROBLEDO, L. M. (Departamento de Física Teórica and CIAFF, Universidad Autónoma de Madrid)

Presenter: Ms BANO, Parveen (School of Physics, Sambalpur University)

Session Classification: Young Scientist Session 3

Contribution ID: **4** Type: **not specified**

Nuclide identification algorithm for polyvinyl toluene scintillation detector based on artificial neural network

Thursday, 19 August 2021 15:30 (15 minutes)

Radiation Portal Monitors (RPMs) are highly sensitive fixed installation systems designed to detect illicit radioactive material trafficking. RPMs are typically installed with detectors that have a high detection efficiency, such as plastic detectors. However, due to these detectors' limited energy resolution, radioisotope identification from their spectra is often not of interest. This research describes a radioisotope identification technique based on an artificial neural network that was applied to the gamma spectrum received from the large-size EJ-200 plastic detector. The simulated gamma spectra using MCNP-5 are used to generate the training data set. With an Exact Match Ratio of 98.8 percent, this method can precisely detect a single or mixture of radioisotopes in the gamma spectrum. In addition, the model can analyses gamma spectrum with up to 10% gain shift, up to 40° incident angle, and sealed source with good precision. This study also presents the model's sensitivity to each isotope in order to attain a True Positive rate of 95%. For radioisotopes detection, this model is usable on RPMs employing a large-size EJ-200 plastic scintillation detector.

Experimental nuclear physics

1

Theoretical nuclear physics

Primary authors: Mr HIEP, Cao Van (Vietnam Military Institute of Chemical and Environmetal Engineering); Dr HUNG, Dinh Tien (Vietnam Military Instutute of Chemical and Environmental Engineering)

Presenter: Mr HIEP, Cao Van (Vietnam Military Institute of Chemical and Environmetal Engineering)

Session Classification: Young Scientist Session 4

Contribution ID: **5** Type: **not specified**

Equation of States of Nuclear Matter and Tidal deformation of Neutron Star

Monday, 16 August 2021 15:30 (15 minutes)

The equation of states of (EoS) of the spin polarized, asymmetric nuclear matter (NM) is studied within the nonrelativistic Hartree-Fock (HF) formalism using realistic choices for the in-medium (density dependent) nucleon-nucleon (NN) interaction, dubbed as CDM3Y4, CDM3Y5, CDM3Y6 and CDM3Y8. Two scenarios for the density dependence of the spin polarization Δ of baryons in NM are considered, and the obtained HF results are compared with the empirical constraints for the nuclear symmetry energy given by the nuclear structure studies and the astrophysical observations of the binary NS merger (GW170817 and GW190425). A partial spin polarization of baryons ($\Delta < 1.0$) at low baryon densities seems more reasonable, with the HF results for the symmetry energy and incompressibility of NM being quite close to the empirical values. The mean-field based EoS of asymmetric NM is used further to construct the β-stable neutron star (NS) matter of strongly interacting baryons (protons and neutrons), electrons, and muons.

The EoS of NS matter over a wide range of baryon densities is used as input for the calculation of the macroscopic configuration of NS within the framework of General Relativity (GR), like the gravitational mass M, radius R, gravito-electric and gravito-magnetic tidal deformability. Given the empirical constrains inferred from the gravitational-wave signals of GW170817 and the mass limit of the heaviest pulsars observed, we conclude that the EoS of NS matter given by the CDM3Y6 and CDM3Y8 versions of the in-medium NN interaction is the most appropriate for the study of NS. The Love numbers of the tidal deformation of NS in a binary system are calculated up to the 4th order and a correlation of the tidal deformability of NS with its gravitational mass is shown.

Keywords: Neutron star, Magnetar, Spin polarization, Equation of state, Nuclear matter, Tidal deformability, Love number, Gravitational wave.

Experimental nuclear physics

Theoretical nuclear physics

1

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Presenter: NGUYEN HOANG DANG, Khoa (University of Science and Technology of Hanoi)

Session Classification: Young Scientist Session 1

Contribution ID: **6** Type: **not specified**

Atom Traps of Rare Isotopes at the Precision and Sensitivity Frontier in Nuclear Physics 1

Monday, 16 August 2021 10:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. MUELLER, Peter (ANL)

Contribution ID: **7** Type: **not specified**

Atom Traps of Rare Isotopes at the Precision and Sensitivity Frontier in Nuclear Physics 2

Tuesday, 17 August 2021 10:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. MUELLER, Peter (ANL)

Contribution ID: **8** Type: **not specified**

Atom Traps of Rare Isotopes at the Precision and Sensitivity Frontier in Nuclear Physics 3

Wednesday, 18 August 2021 10:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. MUELLER, Peter (ANL)

Contribution ID: **9** Type: **not specified**

Atom Traps of Rare Isotopes at the Precision and Sensitivity Frontier in Nuclear Physics 4

Thursday, 19 August 2021 10:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. MUELLER, Peter (ANL)

Contribution ID: **10** Type: **not specified**

From nuclei to stars with a relativistic density functional 1

Monday, 16 August 2021 14:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Dr TYPEL, Stefan (GSI)

Contribution ID: **11** Type: **not specified**

From nuclei to stars with a relativistic density functional 2

Tuesday, 17 August 2021 14:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Dr TYPEL, Stefan (GSI)

Contribution ID: **12** Type: **not specified**

From nuclei to stars with a relativistic density functional 3

Wednesday, 18 August 2021 14:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Dr TYPEL, Stefan (GSI)

Contribution ID: **13** Type: **not specified**

From nuclei to stars with a relativistic density functional 4

Thursday, 19 August 2021 14:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Dr TYPEL, Stefan (GSI)

Contribution ID: **14** Type: **not specified**

How to study nuclear clusters experimentally?

Monday, 16 August 2021 13:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: YAMAGUCHI, Hidetoshi (Center for Nuclear Study, the University of Tokyo)

Contribution ID: **15** Type: **not specified**

How to study nuclear clusters experimentally? 2

Tuesday, 17 August 2021 11:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: YAMAGUCHI, Hidetoshi (Center for Nuclear Study, the University of Tokyo)

Contribution ID: **16** Type: **not specified**

How to study nuclear clusters experimentally? 3

Wednesday, 18 August 2021 11:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: YAMAGUCHI, Hidetoshi (Center for Nuclear Study, the University of Tokyo)

Contribution ID: **17** Type: **not specified**

How to study nuclear clusters experimentally? 4

Friday, 20 August 2021 10:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: YAMAGUCHI, Hidetoshi (Center for Nuclear Study, the University of Tokyo)

Contribution ID: **18** Type: **not specified**

R&D for nuclear fusion reactors, High temperature plasma as a complex system 1

Friday, 20 August 2021 11:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. EJIRI, Akira

Contribution ID: **19** Type: **not specified**

R&D for nuclear fusion reactors, High temperature plasma as a complex system 2

Friday, 20 August 2021 13:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. EJIRI, Akira

Contribution ID: **20** Type: **not specified**

Probing nuclear clustering with knockout reactions

Wednesday, 18 August 2021 13:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Dr YANG, Zaihong

Contribution ID: **21** Type: **not specified**

Direct reactions as quantum probes of sub-atomic system 1

Monday, 16 August 2021 11:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. SHIMOURA, Susumu (CNS)

Contribution ID: **22** Type: **not specified**

Direct reactions as quantum probes of sub-atomic system 2

Tuesday, 17 August 2021 13:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. SHIMOURA, Susumu (CNS)

Contribution ID: **23** Type: **not specified**

Direct reactions as quantum probes of sub-atomic system 3

Thursday, 19 August 2021 13:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. SHIMOURA, Susumu (CNS)

Contribution ID: **24** Type: **not specified**

Direct reactions as quantum probes of sub-atomic system 4

Friday, 20 August 2021 14:30 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. SHIMOURA, Susumu (CNS)

Contribution ID: **25** Type: **not specified**

Performance of the CAT-TPC based on two-dimensional readout strips

Thursday, 19 August 2021 15:45 (15 minutes)

A gas detector with a size of 140×140×140 mm^3, named the Compact Active Target Time Projection Chamber (CAT-TPC), has been developed aiming to measure resonant scattering associated with cluster structures in unstable nuclei. The CAT-TPC consists of an electronic field cage, double thick gas-electron-multiplier foils, a general purpose digital data acquisition system, and especially a newly developed two-dimensional strip-readout structure. The CAT-TPC was operated with ^{4}He (96%) + CO_2 (4%) gas mixture at 400 mbar. The working gas also serves as an active target for tracking of charged particles. The overall performances of this CAT-TPC were evaluated by using a collimated alpha-particle source. A time resolution of less than 20 ns and a position resolution of less than 0.2 mm was observed along the electron drift direction. The three-dimensional images of incident trajectories and scattering events can be clearly reconstructed with an angular resolution of about 0.45 degree.

Experimental nuclear physics

1

Theoretical nuclear physics

Primary author: YANG, Lisheng (Peking University)

Presenter: YANG, Lisheng (Peking University)

Session Classification: Young Scientist Session 4

Contribution ID: **26** Type: **not specified**

opening

Monday, 16 August 2021 09:50 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. SHIMOURA, Susumu (CNS)

Contribution ID: **27** Type: **not specified**

Closing

Friday, 20 August 2021 15:30 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Contribution ID: **28** Type: **not specified**

Award ceremony

Friday, 20 August 2021 15:20 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Contribution ID: **30** Type: **not specified**

Study of octupole correlations in neutron deficient nuclei having A<120 by means of lifetime measurement.

Tuesday, 17 August 2021 15:30 (15 minutes)

The nuclei having A ~120 (50 ≤ Z ≤ 56) are of considerable interest because of the competing shape driving tendencies of their orbitals occupied by the neutrons and the protons. Due to presence of both quadrupole and the octupole collectivity in the neutron deficient Ba, Cs and Xe nuclei with mass A ~ 120 have attracted much attention in recent years. For nuclei with A < 120, due to their closeness to the proton drip line and therefore difficulty to populate via fusion evaporation reactions, octupole collectivity has been reported in very few cases like ^{114,116,117}Xe & ^{110}Te [1,2]. In these reported cases also, there have been several ambiguities observed in the nature of octupole correlations. Like in ^{110}Te, the measured B(E1) strengths (the most prominent experimental evidence considered for octupole correlations) are found to be in agreement when compared to those in the neutron-rich barium nuclei. However, when compared to ^{114,116}Xe, the B(E1) values in ^{110}Te are found to be about an order of magnitude larger, thereby making the T_z scaling of the dipole moment suggested in [1] questionable. Also, in case of ^{114}Xe, the B(E1) value of the $5^- \rightarrow 6^+$ transition is two orders of magnitude larger than that of $5^- \rightarrow 4^+$ transition, thus contradicting a simple interpretation based on fixed intrinsic octupole deformation. Also, decoupling negative-parity bands observed in ^{118}Xe are suggested to have octupole character at low spins but there is a need to be confirmed using lifetime measurements [3]. So, more experiments are needed to systematically investigate whether the octupole phenomenon is common in the A ~120 region. With this motivation, recently experiment was carried out to explore the high spin states in neutron deficient ^{118}Xe nuclei via lifetime measurement using Doppler shift attenuation method (DSAM) technique at the Inter University Accelerator Centre (IUAC), Delhi. High spin states in ^{118}Xe were populated using the ^{93}Nb (^{28}Si, p2n) ^{118}Xe fusion evaporation reaction at a beam energy of 115 MeV. The target consisted of nicely rolled 93Nb foil of thickness ~ 1.0 mg/cm^2 on 10 mg/cm^2 thick Pb backing. The de-exciting gamma rays were detected with the Indian National Gamma Array (INGA) setup [4], consisting of 16 Compton suppressed Clover detectors arranged in five rings at angles 32°, 57°, 90°, 123°, and 148° with respect to the beam direction. Data was collected in γ - γ coincidences mode for the 9 shifts resulting in total number of counts acquired in γ-γ coincidence were 6*10^8. To optimize yield of ^{118}Xe, excitation function was taken at 112, 115, 116 and 120 MeV of beam energy. A number of symmetric and asymmetric matrices were constructed by sorting gain matched list mode data. Lineshape analysis were carried out for some of the prominent transitions observed in yrast band, negative-parity band and interlinking transitions of E1 character. E1 character of these interlinking transitions are confirmed using angular correlation and linear polarization asymmetry ratio (Δ_{asym}) measurements. These lineshape results would be further discussed in the seminar.

References:

[1] S. L. Rugari et al., Phys. Rev. C 48, 2078 (1993).
[2] E. S. Paul et al., Phys. Rev. C 50, R534 (1994).
[3] S. Tormanen, et al., Nuclear Physics A 572 417 –458 (1994).
[4] S. Muralithar et al., Nucl. Instr. Meth. Phys. Res. A 622, 281 -287 (2010).

Experimental nuclear physics

1

Theoretical nuclear physics

Primary author: PANDEY, Anand (University of Delhi)

Presenter: PANDEY, Anand (University of Delhi)

Session Classification: Young Scientist Session 2

Contribution ID: **31** Type: **not specified**

12C + 12C fusion at low energies

Tuesday, 17 August 2021 15:45 (15 minutes)

Nuclear fusion reactions have very important significance in the area of nuclear astrophysics because they determine the nucleosynthesis of the elements in early stages of the universe and control the energy generation and evolution of stars. The precise knowledge of cross-sections and reaction rates of these nuclear fusion reactions are very important to describe the evolution of universe. There are various reactions which have strong significance in astrophysical aspects but our plan is to perform to experimentally study the 12C+12C fusion reaction at very low energies. This reaction is referred as carbon burning in stellar evolution process. Carbon burning plays a very important role in star which has mass greater than the eight solar mass (M > 8MΘ). If mass is nearly 8MΘ, then may end up as white dwarf and if mass is sufficiently larger than the 8MΘ then it may show core-collapse supernovae.

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Direct measurements of 12C+12C fusion cross sections have been performed over a wide range of e
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The indirect Trojan Horse Method was applied [2] to measure the astrophysical S-factor for 12C+
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In the light of the above scenario, it has become very important to measure the fusion cross se
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[1] T. Spillane et al., Phys. Rev. Letts, 98, 122501 (2007)

[2] A. Tumino et al., Nature 557, 687 (2018)

[3] A.M. Mukhamedzhanov et al, 99, 064618 (2019)

Experimental nuclear physics

1

Theoretical nuclear physics

Primary authors: Mr GUPTA, Ashish (SRF); Prof. MUKHERJEE, Anjali (Professor)

Presenter: Mr GUPTA, Ashish (SRF)

Session Classification: Young Scientist Session 2

Contribution ID: **32** Type: **not specified**

Extension of Migdal-Watson formula and its application to binary breakup reaction

Monday, 16 August 2021 15:45 (15 minutes)

Resonance phenomena appearing in low-energy nuclear reactions are very important in studies of nucleosynthesis in cosmos because reaction rates in the synthesis are strongly affected by the resonance parameters: resonance energy and decay width. In particular, the inelastic scattering to the continuum energy states above the particle decay threshold, which is often called breakup reaction, is very useful to explore the resonance parameters.
In order to derive the resonance parameters from the observed strength of the breakup reactions, the evaluation of the non-resonant background strength is indispensable because the resonant enhancement, which has the strong energy dependence, are embedded in the non-resonant background contribution with a broad structure. Since the background strength is structure-less and must have the weak energy dependence, the shape of the non-resonant background strength is often assumed by the simple analytic function or evaluated from the simple reaction mechanism, such as the direct breakup without the final state interaction between the decaying fragments. Unfortunately, there is no theoretical prescription to describe the non-resonant background strength on the basis of the simple analytic formula.
In this report, we propose an analytic formula to evaluate the non-resonant background strength by extending the Midgal-Watson (MW) theory [1], which was originally considered for the s-wave breakup reaction in the charge neutral systems [2-4]. In the evaluation of the background strength for the binary breakup, we employ the complex scaling method (CSM), which is a powerful tool to describe the few-body continuum states [5].
We have calculated the non-resonant breakup strength of ^{20}Ne into α + ^{16}O and ^{12}Be into α + ^{8}He by CSM, and the CSM strength is fitted by the analytic function, which is obtained by the extended MW formula. We will demonstrate that our analytic formula can nicely reproduce the non-resonant strength in these binary breakup reactions. Moreover, we will report the physical meaning of new parameters, which are introduced in extending the original MW formula, in connection to the spatial size of the initial wave function in the breakup reactions.

[1] R. Nakamoto, M. Ito, A, Saito and S. Shimoura, Phys. Rev. C, in press (2021).
[2] K. Watson, Phys. Rev. C88, 1163 (1952).
[3] A. Migdal, Sov. Phys. JETP 1, 2 (1955).
[4] S. Shimoura, Phys. Jour. Plus 133, 463 (2018).
[5] T.Myo et al. Prog, theor, phys,Vol.99, 5 (1998).

Experimental nuclear physics

Theoretical nuclear physics

1

Primary authors: NAKAMOTO, Riu; ITO, Makoto (Department of Pure and Applied Physics, Kansai University); Prof. SAITO, Akito (Dept. of Rad. Oncol. Hiroshima Univ.); Prof. SHIMOURA, Susumu (CNS)

Presenter: NAKAMOTO, Riu

Session Classification: Young Scientist Session 1

Contribution ID: **33** Type: **not specified**

OEDO/SHARAQ activitiy, CNS, Univ. of Tokyo

Monday, 16 August 2021 17:00 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr LI, Jiatai (CNS)

Session Classification: After Class Session 1

Contribution ID: **34** Type: **not specified**

Fundamental physics group, CNS Univ. of Tokyo

Monday, 16 August 2021 17:40 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: OZAWA, Naoya (Center for Nuclear Study, The University of Tokyo)

Session Classification: After Class Session 1

Contribution ID: **36** Type: **not specified**

Nuclear Theory group, Univ. of Tokyo

Wednesday, 18 August 2021 17:10 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr NAITO, Tomoya (Department of Physics, The University of Tokyo/RIKEN Nishina Center)

Session Classification: After Class session 2

Contribution ID: **37** Type: **not specified**

Nuclear Physics Lab.The University of Hong Kong

Monday, 16 August 2021 17:50 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr MING, Yap Jinn

Session Classification: After Class Session 1

Contribution ID: **38** Type: **not specified**

Introduction of Beijing Normal University

Wednesday, 18 August 2021 17:20 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Ms LI, Xinyue (Beijing Normal University)

Session Classification: After Class session 2

Contribution ID: **39** Type: **not specified**

Nuclear Theory group, Tokyo Institute of Tech

Monday, 16 August 2021 18:00 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Prof. KAZUYUKI, Sekizawa

Session Classification: After Class Session 1

Contribution ID: **40** Type: **not specified**

Super Heavy Element Group, Kyushu Univ.

Wednesday, 18 August 2021 16:40 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr YUTO, Nagata (Kyushu University)

Session Classification: After Class session 2

Contribution ID: **43** Type: **not specified**

Thermal blocking effect and pairing reentrance in excited odd nuclei

Monday, 16 August 2021 16:00 (15 minutes)

It has been well-known that the pairing correlations decrease with increasing temperature T. However, recent studies have reported a possible increase of pairing correlation in excited (hot) odd nuclei at low temperature (T < 0.5 −1 MeV), which is associated to the pairing reentrance phenomenon [1, 2]. The latter has been explained due to the blocking effect of odd nucleon in odd nuclei at finite temperature. This blocking effect possibly depends on few single-particle levels above and below the Fermi surface where the odd nucleon can redistribute at nonzero temperature. In this study, we perform a systematic investigation of such a pairing reentrance in odd nuclei based on the exact solution of pairing problem at finite temperature. Our investigation starts with a simple doubly-folded multilevel pairing model by varying the energies of some single-particle levels above and below the Fermi surface. Calculations will be then extended to some calcium isotopes using a realistic axially deformed Woods-Saxon potential.

References
[1] N. Quang Hung, N. Dinh Dang, and L. T. Quynh Huong, Phys. Rev. C 94, 024341 (2016).
[2] Balaram Dey, Srijit Bhattacharya, Deepak Pandit, N. Dinh Dang, N. Ngoc Anh, L. Tan Phuc, and N. Quang Hung, Phys. Lett. B 819, 136445 (2021).

Experimental nuclear physics

Theoretical nuclear physics

1

Primary authors: TRAN , Vu Dong (VNUHCM - University of Science); Dr LE , Tan Phuc (Institute of Fundamental and Applied Sciences, Duy Tan University, Ho Chi Minh City, Vietnam); Prof. NGUYEN, Quang Hung (Institute of Fundamental and Applied Sciences, Duy Tan University, Ho Chi Minh City, Vietnam)

Presenter: TRAN , Vu Dong (VNUHCM - University of Science)

Session Classification: Young Scientist Session 1

Contribution ID: **44** Type: **not specified**

Measurement of long-range two-particle correlations with ALICE

Tuesday, 17 August 2021 16:00 (15 minutes)

Measurements of long-range two-particle correlations have long provided critical insights into the properties of the matter created in heavy-ion collisions.
I will present results on long-range two-particle correlations for different charged particles multiplicities in pp at $\sqrt{s} = 13$ TeV and in p-Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV.
These measurements utilize the Forward Multiplicity Detector (FMD), which allows for unprecedented $\Delta\eta$ ranges to be explored (up to $\Delta\eta\ \sim 8$).
We will compare such measurements to predictions from the relativistic hydro model calculation that supposes the QGP and Monte Carlo generators, which helps us to understand the contribution from non-QGP-like processes in an unexplored kinematic regime.

Experimental nuclear physics

Theoretical nuclear physics

Primary author: SEKIGUCHI, Yuko (CNS)

Presenter: SEKIGUCHI, Yuko (CNS)

Session Classification: Young Scientist Session 2

Contribution ID: **45** Type: **not specified**

Search for permanent EDM using Fr atoms

Thursday, 19 August 2021 16:30 (15 minutes)

The existence of the permanent Electric Dipole Moment (EDM) implies the time reversal symmetry violation. This violation directly means CP violation by the CPT theorem, and it would be expected to explain the observed matter-antimatter asymmetry.
The T-violation predicted by the Standard Model (SM) of particle physics for the electron EDM is too small to be measured with current experimental technique and the larger EDM would indicate a new physics beyond SM. This tiny effect of EDM can be enhanced by the relativistic effects in the heavy atoms such as francium (Fr).
In this talk, we will see the overview of the experimental setup of the search for EDM using laser cooled 221-Fr atoms, produced from the alpha decay of 225-Ac, which can be used as the generator for 221-Fr, and has a long lifetime ~ 10 days.
The 221-Fr nucleus has a large octupole deformation effect and can become the candidate to search for the nuclear EDM. The new experimental apparatus to produce the high intensity 225-Ac source, and laser cooling for 221-Fr is now developing. The present status will be discussed.

Experimental nuclear physics

1

Theoretical nuclear physics

Primary author: SATO, Motoki (University of Tokyo)

Co-authors: SAKEMI, Yasuhiro (CNS); NAGAHAMA, Hiroki (The University of Tokyo); NAKAMURA, Keisuke (CNS, The University of Tokyo); KAMAKURA, Keita (CNS, UTokyo); KOTAKA, Yasuteru; OZAWA, Naoya (Center for Nuclear Study, The University of Tokyo); Mr NAGASE, Shintaro; Prof. MATSUDA, Yasuyuki; Dr AOKI, Takatoshi; Mr YAMANE, Kazeki; Mr NAKASHITA, Teruhito; Dr TANAKA, Kazuo; Dr UENO, Hideki; Dr AIKO, Takamine; Dr HABA, Hiromitsu; HAYAMIZU, Tomohiro (CNS); Dr ICHIKAWA, Yuichi; Prof. MATSUO, Yukari

Presenter: SATO, Motoki (University of Tokyo)

Session Classification: Young Scientist Session 4

Contribution ID: **46** Type: **not specified**

Charge changing cross section and proton distribution radii of Be isotopes

Tuesday, 17 August 2021 16:15 (15 minutes)

In this research, we tested a new idea to measure proton-distribution radii ($r_{\rm p}$) by heavy-ion secondary beam experiments. It is important for understanding the structures of nuclei to know the proton- and the neutron-distribution radii independently. From this point of view, we tried to develop a new method to deduce proton-distribution radii ($r_{\rm p}$) very efficiently using nuclear collisions .

Now, $r_{\rm p}$ can be measured by electron scattering and isotope shift measurements. They have high accuracy and precision, but applicable unstable nuclei are rather limited. On the other hand, the present new method could have the same degrees of accuracy and could measure a wide range of unstable nuclei.

The experiment was carried out at HIMAC, Heavy Ion Medical Accelerator in Chiba, in Japan. We measured charge changing cross sections ($\sigma_{\rm cc}$) for $^{7-12}$Be isotopes on proton, Be, C, and Al targets. Charge changing cross section ($\sigma_{\rm cc}$) is the cross section of changing the number of protons in the collision with the target nucleus. We can deduce charge changing cross sections ($\sigma_{\rm cc}$) from the number of incident particles N_1 and charge changed particles N_2:

\begin{equation}
\sigma_{\rm{cc}}=-\frac{1}{t}\rm{ln}\Bigl(1-\it{\frac{N_2}{N_1}}\Bigr)
\end{equation}

In the zeroth-order approximation, charge changing reaction can be attributed to the abrasion of protons in the incident nucleus by nucleons in the target nucleus. A schematic drawing of this process is shown in figure 1. Thus it is approximated by equation (2).

\begin{equation}
\sigma_{\rm{cc}}=\pi(r_{\rm{T}}+r_{\rm{p}})^2
\end{equation}

![charge changing][1]

From eq (2), we can derive proton radii if target's nucleon radius $r_{\rm T}$ and $\sigma_{\rm cc}$ are known. In practice, we need to use Glauber calculation with more realistic proton and neutron distributions both in the projectile and the target nuclei.

Thus, when trying to link the charge change cross-section and the proton distribution radius, the consideration of the proton evaporation process shown in fig. 2 is considered to be very important.
In this process, neutrons are firstly abraded, which excites prefragment and results in the evaporation of protons. If this process could be extracted independently, it would be very useful in deriving the proton-distribution radii from the charge change cross sections.

![proton evaporation][2]

In the experiment, we used proton, Be, C, and Al targets. Proton target is particularly sensitive to neutrons in the projectile reflecting the isospin asymmetry of the nucleon-nucleon total cross sections, which amplifies neutron abrasion. In short, the proton-evaporation effect has large portion of the charge changing cross section on proton target $\sigma_{cc}^{\rm p}$.

So, we assumed that $\sigma_{cc}^{\rm p}$ multiplied by some value x: $x\sigma_{cc}^{\rm p}$ is the cross section of proton evaporation for Be, C, and Al targets. Therefore, adding $x\sigma_{cc}^{\rm p}$ to eq (2) would reproduce the experimental results of charge changing cross sections.

In practice, we introduced x for each target and a constant parameter Y as the first and second approximation terms:

\begin{equation}
\sigma_{cc} = \sigma_{\rm{Glauber}} +
x\Bigl(\sigma^{\rm{p}}{\rm{cc}}-[\sigma^{\rm{p}}{\rm{Glauber}}+Y]\Bigr)
\end{equation}

As a result, we figured out that only 4 parameters, x(for 3 targets) and Y could reproduce 15 data of charge changing cross section for Be isotopes very well. It suggests a possibility of this new method for the deduction of proton-distribution radii with high accuracy and efficiency applicable to a wide range of unstable nuclei.

![proton distribution radii][3]

Experimental nuclear physics

1

Theoretical nuclear physics

Primary authors: Prof. FUKUDA, Mitsunori (Osaka univ.); Ms FUKUTOME, Miki (Osaka univ.); Ms KIMURA, Yoko (Osaka univ.); Mr MIHARA, Mototsugu (Osaka univ.); Ms OHTANI, Yurika (Osaka univ.); Mr TANAKA, Masaomi (RIKEN); Mr MATSUTA, Kensaku (Osaka univ.); Mr NISHIMURA, Daiki (Tokyo city univ.); Ms TAKECHI, Maya (Niigata univ.); Mr IZUMIKAWA, Takuji (Niigata univ.); Mr TAKAHASHI, Hiroyuki (Tokyo city univ.); Mr SUGAWARA, Sora (Tokyo city univ.); Mr FUKUDA, Shigekazu (QST); Mr SUZUKI, Takeshi (Saitama univ.); Mr NOGUCHI, Norihide (Niigata univ.); Mr OHTSUBO, Takashi (Niigata univ.); Mr TAKATSU, Kazuya (Niigata univ.); Mr YAMAGUCHI, Takayuki (Saitama univ.); Mr OGOSE, Mizuki (Niigata univ.); Mr KITAGAWA, Atsushi (QST); Mr SATO, Shinji (QST); Mr TAKAYAMA, Gen (Osaka univ.)

Presenter: Mr TAKAYAMA, Gen (Osaka univ.)

Session Classification: Young Scientist Session 2

Contribution ID: **47** Type: **not specified**

Compton reconstruction of the Crab under the atmospheric background for GRAMS balloon experiment

Thursday, 19 August 2021 16:00 (15 minutes)

The GRAMS (Gamma-Ray and AntiMatter Survey) project that aims to observe MeV gamma rays and to search for dark matter at the same time started in 2021 on full scale. The MeV gamma-ray region is important for understanding phenomena in the universe such as nucleosynthesis and high-energy particle acceleration. The detector for the project is a large LArTPC (Liquid Argon Time Projection Chamber) with a size of $140 \times 140 \times 20$ cm^3, which works as a Compton camera. A balloon experiment using this detector is planned in the middle of the 2020s. There are a lot of background gamma rays in the atmosphere, so in the present work, the effect of the background in reconstruction of the Crab was evaluated. A Monte Carlo simulation to reproduce the detector response in the atmosphere was performed with ComptonSoft. Because of the computational limitations, the actual observation time corresponding to this simulation is only 100 seconds, but a clear reconstructed image of the Crab was obtained. The results demonstrated the feasibility to reconstruct MeV gamma ray images under atmospheric background and built the foundation for future data analysis.

Experimental nuclear physics

Theoretical nuclear physics

Primary author: OKAWA, Kodai (CNS, the university of Tokyo)

Presenter: OKAWA, Kodai (CNS, the university of Tokyo)

Session Classification: Young Scientist Session 4

Contribution ID: **48** Type: **not specified**

Visualization of nuclear cluster correlation with microscopic wave function

Wednesday, 18 August 2021 16:15 (15 minutes)

In general, the quantum many-body wave function obtained by theoretical calculation contains an enormous amount of information about many-body correlation. However, theoretical analyses in nuclear physics are mainly performed for quantities such as one- and two-body densities, which are obtained after integrating out most of the information in a many-body wave function.

On the other hand, in the field of quantum chemistry, methods have been developed to visualize the information on the correlation of all electrons and applied to the structure study of molecular systems[1]. We are now attempting to apply such a method to nuclear systems. As the first step, we start with finding the most probable arrangement of nucleon coordinates, i.e., calculating the set of position and spin coordinates that maximizes the square of the many-body wave function.

In this talk, we apply this method to Hartree-Fock and Hartree-Fock+BCS wave functions of p-shell and sd-shell nuclei. We found some alpha-cluster-like correlations out of the wave functions obtained without any assumption of cluster structure. We also discuss the effects of pairing correlation on the cluster structure by comparing the results between HF and HF+BCS.

[1] Yu Liu, Terry J. Frankcombe, and Timothy W. Schmidt, Phys. Chem. Chem. Phys. 18, 13385 (2016).

Experimental nuclear physics

Theoretical nuclear physics

1

Primary authors: MATSUMOTO, Moemi (Tohoku University); TANIMURA, Yusuke (Tohoku University)

Presenter: MATSUMOTO, Moemi (Tohoku University)

Session Classification: Young Scientist Session 3

Contribution ID: **49** Type: **not specified**

In-beam γ-ray Spectroscopy of 97Cd

Tuesday, 17 August 2021 16:30 (15 minutes)

^{100}Sn (N=Z=50) and its neighboring nuclei have drawn great attention due to its possible doubly-magic nature and location around the proton drip-line. Being predicted as the end point of rp-process path, the properties of these nuclei also directly affect the synthesis of heavier elements. We therefore performed in-beam γ-ray spectroscopy of ^{100}Sn and the neighboring nuclei using DALI2+ gamma-ray detection array at RIBF RIKEN. In this talk, we will present the measurement of ^{97}Cd (N=49, Z=48). Preliminary level scheme of 97Cd and comparison of shell model calculations will be discussed.

Experimental nuclear physics

1

Theoretical nuclear physics

Primary author: Mr GAO, Ting (The University of Hong Kong)

Co-author: Prof. LEE, Jenny (The University of Hong Kong)

Presenter: Mr GAO, Ting (The University of Hong Kong)

Session Classification: Young Scientist Session 2

Contribution ID: **50** Type: **not specified**

The search for double Gamow-Teller giant resonance using double charge exchange reaction at RIBF

Tuesday, 17 August 2021 16:45 (15 minutes)

Understanding the nature of two sequential occurrences of the Gamow-Teller transition is important not only for the nuclear structure but also for the particle physics. However, there is little experimental information about the double Gamow-Teller transition at present. Especially, although the existence of a giant resonance state in double Gamow-Teller transition (Double Gamow-Teller Giant Resonance, DGTGR) has been theoretically predicted since 1989, it remains unobserved experimentally. The experimental data of DGTGR is suggested to restrict a value of a nuclear matrix element for the neutrinoless double beta decay, which is essential for the determination of the neutrino mass from the lifetime of the neutrino-less double beta decay.
A possible means to observe DGTGR is a heavy-ion double charge exchange reaction. We performed an experiment at RIBF using the (^{12}C, ^{12}Be(0_2^+)) reaction. In this experiment, primary beam of ^{12}C impinged reaction targets placed at F0 of BigRIPS separator. We used BigRIPS as a high precision spectrometer by measuring tracks of ejected particles at dispersive focal plane, F5. We will see an overview of the experiment in the talk.

Experimental nuclear physics

1

Theoretical nuclear physics

Primary author: SAKAUE, Akane (CNS)

Presenter: SAKAUE, Akane (CNS)

Session Classification: Young Scientist Session 2

Contribution ID: **51** Type: **not specified**

Theoretical analysis of mass and angle in the superheavy element region ~the possibility of the Z=120 element for fusion explored from the sticking time~

Monday, 16 August 2021 16:15 (15 minutes)

The next new superheavy element(SHE) locates the 8th period, is the notable element that provides the view on the existence of the predicted "island of stability (114-protons, 184-neutrons)" in the superheavy element region. In addition, neutron-rich nucleus far from the valley of stability in the nuclear chart are thought to have been produced by the r-process caused by supernova explosions and neutron mergers. The n-rich nucleus is important for understanding the origin of elements existing in the universe and the chemical evolution of the universe. For future SHE and n-rich nucleus synthesis, it is indispensable to propose a new method such as using the nucleon transfer reaction in addition to the conventional heavy ion fusion reaction, and to elucidate the reaction mechanism and the mechanism in the formation process. In this study, we focused on the nucleon transfer reactions. In the nucleon transfer reactions, the projectile nucleus receives nucleons from the target nucleus while rubbing around the target nucleus, increases the mass number, and the projectile-like fragment finally apart from the target-like fragment in the certain angle. At that time, there is a correlation between the number of transfer nucleons and the emission angle, and the characteristic differs depending on the projectile and target nucleus. The correlation between mass and angle of the fission fragment mass can understand the mechanism of fission and fusion process.
In this study, we calculated the mass angle distribution(MAD) using the dynamical model and investigated the correlation between mass and angle. As the result, it was possible to show that the correlation between mass and angle in the superheavy element region is different in the superheavy element region. In addition, we investigated the relationship between the fusion possibility for Z=120 and the sticking time from contact to scission.

Experimental nuclear physics

Theoretical nuclear physics

1

Primary author: AMANO, Shota (Kindai University)

Co-author: ARITOMO, Yoshihiro (Kindai university)

Presenter: AMANO, Shota (Kindai University)

Session Classification: Young Scientist Session 1

Contribution ID: **52** Type: **not specified**

Time-Dependent Generator Coordinate Method for many-particle tunneling

Monday, 16 August 2021 16:30 (15 minutes)

Many-body tunneling is an important phenomenon in many fields of physics and chemistry.
In nuclear physics, tunneling effects appear, e.g., in low-energy fusion reactions, spontanious fission and so on.
The microscopic description of such tunneling effects is one of the major goals of nuclear reaction theory.

The time-dependent Hartree-Fock (TDHF) method, or the time-dependent density functional theory (TDDFT),
is one of the most widely used microscopic frameworks for nuclear reactions.
It has been demonstrated that the TDHF successfully describes average behaviors of nuclear reactions
such as the energy-angle correlation in heavy-ion deep inelastic collisions[1].
Because it is based on the nucleonic degrees of freedom,
ideally, the TDHF does not contain any empirical parameter for reactions, once static nuclear properties are well investigated.
This feature will be particularly important in applying the framework to unknown regions where experimental studies are difficult,
e.g., reactions of neutron-rich nuclei.

However, it has been known that the TDHF fails to describe tunneling effect. To overcome this problem, we will discuss the
Time-Dependent Generator Coordinate Method (TDGCM)[2-5] approach in this presentation.

In the TDGCM, one assumes that a many-body wave function is given as a superposition of many Slater determinants,
\begin{align}
\Psi(t)=\sum_af_a(t)\Phi_a(t)
\end{align}
where f_a is a weight function and Φ_a is a Slater determinant. %with single-particle wave functions $\{\phi_{ai}\}$.
The index a distinguishes each Slater determinant to one another, and is referred to as a generator coordinate.
The time evolution of the weight functions $f_a(t)$ and the Slater determinants $\Phi_a(t)$
are determined by the time-dependent variational principle.
We have applied this method to collision of an α particle on an external Gaussian barrier in one dimension.
In our calculation, the initial values of the center of mass position and momentum of the α particle is taken as the generator coordinates.
We obtained the energy dependence of transmission probability.

\noindent [1]
A.K. Dhar, B.S. Nilsson, K.T.R. Davies, and S.E. Koonin, Nucl. Phys. {\bf A364}, 105 (1981). \\
\noindent [2]
N. Hasegawa, K. Hagino and Y. Tanimura, Phys. Lett. {\bfseries B 808}, 135693 (2020).\\
\noindent [3]
P.-G. Reinhard, R. Y. Cusson, and K. Goeke, Nuclear Physics A {\bf 398}, 141 (1983).\\
\noindent [4]
E. Orestes, K. Capelle, A.B. da Silva, and C.A. Ullrich, J. Chem. Phys. {\bf 127}, 124101 (2007). \\

\noindent [5]
J. Richert, D.M. Brink, and H.W. Weidenm\"uller, Phys. Lett. {\bf 87B}, 6 (1979).\\

Experimental nuclear physics

Theoretical nuclear physics

1

Primary author: HASEGAWA, Naoto (Tohoku univ.)

Co-authors: Prof. HAGINO, Kouichi; Dr TANIMURA, Yusuke

Presenter: HASEGAWA, Naoto (Tohoku univ.)

Session Classification: Young Scientist Session 1

Contribution ID: **54** Type: **not specified**

ISGMR measurement in Xe isotope with CAT-M

Thursday, 19 August 2021 16:15 (15 minutes)

The nuclear matter compressibility (K_τ) is an important physical quantity that can directly determine a part of the equation of state of nuclear matter. In order to determine K_τ with high accuracy, it is indispensable to determine the compressibility of many nuclei (K_A). We have been developing an active target CAT-M for the purpose of systematic measurement of an isoscalar giant monopole resonance (ISGMR).
In this study, we performed a ISGMR measurement using the ^{136}Xe (d, d') reaction as the first measurement of systematic measurements with the Xe isotope. A dipole magnet was newly introduced into CAT-M for eliminate the delta rays by high intensity heavy ion beam in the experiment. Moreover a Mini TPC that has $10\times30\times30\mathrm{mm}^3$ active volume , was introduced for measure the beam angle. We will report the outline of the experiment.

Experimental nuclear physics

1

Theoretical nuclear physics

Primary author: ENDO, Fumitaka (Tohoku Univ)

Presenter: ENDO, Fumitaka (Tohoku Univ)

Session Classification: Young Scientist Session 4

Contribution ID: **55** Type: **not specified**

RIBF overview

Thursday, 19 August 2021 11:00 (50 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Dr NAIMI, Sarah (RIKEN Nishina Center)

Contribution ID: **56** Type: **not specified**

Nuclear and Hadronic Physics Lab. Kyoto Univ.

Wednesday, 18 August 2021 17:30 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenters: Mr YAHIRO, Kanta; Mr EBATA, Kengo; Mr YOSHIDA, Ryosuke

Session Classification: After Class session 2

Contribution ID: **57** Type: **not specified**

Duy Tan University

Monday, 16 August 2021 17:10 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Dr LE, Tan Phuc

Session Classification: After Class Session 1

Contribution ID: **58** Type: **not specified**

Nuclear Experimental Group, Osaka University

Monday, 16 August 2021 17:20 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr TAKAYAMA, Gen (Osaka univ.)

Session Classification: After Class Session 1

Contribution ID: **59** Type: **not specified**

Nuclear Experimental group lab, Peking University

Monday, 16 August 2021 17:30 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr YANG, Lisheng (Peking University)

Session Classification: After Class Session 1

Contribution ID: **60** Type: **not specified**

Nuclear Astrophysics group, Sungkyunkwan Univ.

Wednesday, 18 August 2021 16:50 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: KIM, Minju

Session Classification: After Class session 2

Contribution ID: **61** Type: **not specified**

Nuclear Astropysics Group CNS, Univ. of Tokyo

Wednesday, 18 August 2021 17:00 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr SHIMIZU, Hideki (CNS, Univ. of Tokyo)

Session Classification: After Class session 2

Contribution ID: **62** Type: **not specified**

Universiti Teknologi Malysis

Wednesday, 18 August 2021 17:40 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Ms SYAMIMI, Mastura

Session Classification: After Class session 2

Contribution ID: **63** Type: **not specified**

Can Tho University

Wednesday, 18 August 2021 17:50 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr LE DANG, Khoa (Can Tho University)

Session Classification: After Class session 2

Contribution ID: **64** Type: **not specified**

Nuclear physics group, University of Delhi

Wednesday, 18 August 2021 18:00 (10 minutes)

Experimental nuclear physics

Theoretical nuclear physics

Presenter: Mr PANDEY, Anand

Session Classification: After Class session 2