East Asian Workshop on Exotic Hadrons 2024

Report of Contributions

https://indico.itp.ac.cn/e/247

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

Plenary session

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

Global coupled-channel analysis of ee -> ccbar data

Recent high-precision e^+e^-⟶ccbar data from the BESIII and Belle are highly useful to understand the vector charmonium pole structure and puzzling line shapes due to the exotic hadron candidates Y. We thus conduct a global coupled-channel analysis of most of the available data (9 two-body, 8 three-body, and 1 four-body final states) in √s=3.75-4.7GeV. Not only cross sections but also invariant mass distributions of subsystems are fitted. Our model includes dozens of (quasi) two-body states that nonperturbatively couple with each other through bare charmonium excitations and particle-exchange mechanisms required by the three-body unitarity. The amplitudes obtained from the fits are analytically continued to vector charmonium and Zc poles. We do not find a ψ(4160) pole that has been considered well-established. Instead, we find two poles of ~4230MeV; ψ(4230) with Γ=36MeV and a broader one with Γ=114MeV. Two Zc poles are found as virtual states ~40MeV below the D* D*_bar thresholds, being consistent with lattice QCD results. This work presents the first global analysis to determine the vector charmonium and Zc poles, thereby paving the way to extracting detailed properties of the prominent exotic hadron candidates from data. This presentation is based on arXiv:2312.17658.

Primary author(s) : NAKAMURA, Satoshi (Shandong University)

Presenter(s) : NAKAMURA, Satoshi (Shandong University)

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

On the determination of the D meson width in the nuclear medium with the transparency ratio

We have studied the feasibility of the experimental determination of the width of a D meson in a nuclear medium by using the method of the nuclear transparency. The cross section for inclusive production of a D^+ in different nuclei is evaluated, taking care of the D^+ absorption in the nucleus, or equivalently, the survival probability of the D^+ in its way out of the nucleus from the point of production. We use present values of the in medium width of D mesons and calculate ratios of the cross sections for different nuclei to the ^{12}C nucleus as reference. We find ratios of the order of 0.6 for heavy nuclei, a large deviation from unity, which indicates that the method proposed is adequate to measure this relevant magnitude, so far only known theoretically.

Primary author(s) : MONTESINOS, Victor (IFIC (CSIC-UV)); Dr IKENO, Natsumi (Tottori University); Dr OSET, Eulogio (Institut de Fisica Corpuscular); Dr ALBALADEJO, Miguel (Institut de Fisica Corpuscular); Dr NIEVES, Juan (Institut de Fisica Corpuscular); Dr TOLOS, Laura (Institute of Space Sciences)

Presenter(s) : MONTESINOS, Victor (IFIC (CSIC-UV))

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

Study of the decay width of Tcc tetraquark based on a quark model

In this talk, I briefly summarize the main points of an on-going work on the study of the decay width of the tetraquark Tcc(3875) based on a quark model.
In this work, we propose a method to calculate the decay width of Tcc to D+D+pi in a quark model, by adding the repulsive force between two light quarks, and analyze the correlations among the binding energy, the decay width, the distance between two charm quarks, and so on. We find that, although there is no strong correlation between the binding energy and the distance, there is strong correlation between the binding energy and the distance.
Our results show that study of the decay width is important to clarify the structure of Tcc, and indicate that the Tcc has the meson-molecule structure.

Primary author(s) : Prof. HARADA, Masayasu (Nagoya University)

Presenter(s) : Prof. HARADA, Masayasu (Nagoya University)

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

Classification of eigenstates in coupled-channel scattering amplitude with the chiral unitary method

Xi(1620) and Xi(1690) have recently been actively studied both experimentally and theoretically.
We have constructed the models which are based on the Belle and ALICE experimental results, with the chiral unitary method previously.[1]
In this study we discuss the physical origin of poles in the scattering amplitude by extrapolating different models.
We also study the near Kbar-Lambda threshold pole trajectory with different channel coupling strength in the Weinberg-Tomozawa potential.
With this analysis we aim to clarify the physical properties of the eigenstates in the constructed scattering amplitudes.

[1]T.Nisihibuchi and T.Hyodo, Phys. Rev. C 109, no1, 015203 (2024)

Primary author(s) : NISHIBUCHI, Takuma (Tokyo Metropolitan University); Mr HYODO, Tetsuo (Tokyo Metropolitan University)

Presenter(s) : NISHIBUCHI, Takuma (Tokyo Metropolitan University)

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

Dynamical generation of hidden-charm meson states in heavy meson scattering

In this presentation, we explore the dynamical generation of hidden-charm scalar and tensor meson states ($J^PC = 0^{++}, 2^{++}$) in heavy-meson scattering. Our methodology involves solving the off-shell coupled-channel integral equation within a meson-exchange framework. We construct the kernel matrix using an effective Lagrangian that respects both heavy quark symmetry and hidden local symmetry. By applying the matrix inversion method to solve the integral equation, we obtain transition amplitudes for four distinct channels. Our findings reveal a scalar bound state below the D\bar{D} threshold and two cusps near the $D^*\bar{D}^*$ threshold in both scalar and tensor channels. We will discuss in detail the coupled-channel effects contributing to the generation of these states, providing insights into the complex dynamics of heavy-meson interactions and the emergence of exotic meson states. This investigation enhances our understanding of the intricate behavior of heavy mesons and contributes to the broader field of hadron spectroscopy.

Primary author(s) : KIM, Hee-Jin (Inha University); Prof. KIM, Hyun-Chul (Inha University)

Presenter(s) : KIM, Hee-Jin (Inha University)

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

Exclusive J/ψ photoproduction on nucleon and nuclei

We investigate J/ψ meson photoproduction on the nucleon and (d, ^{4}He, ^{16}O, ^{40}Ca) targets within a dynamical model approach. Within the multiple scattering theory, the calculations have been performed by including the impulse amplitude and the final J/ψ-nucleus scattering amplitude. The impurse term for the deuteron target can be calculated using the wavefunctions generated from the realistic NN potentials. The FSI amplitude is calculated using the first-order optical potentials constructed from the J/ψ-N potentials. We compare our results with the recent GlueX and Hall C data from the JLab.

Primary author(s) : Prof. LEE, T.-S. Harry (Argonne National Laboratory)

Co-author(s) : KIM, Sangho (Soongsil University)

Presenter(s) : KIM, Sangho (Soongsil University)

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

Study of the Δ(1232) resonance substructure in the pγ→Δ(1232) process through helicity amplitudes

The substructure of the $\Delta(1232)$ resonance in the $p\gamma^* \to \Delta(1232)$ process is studied through helicity transition amplitudes within the quark model framework. We consider the involved baryons composed of three quarks, and both the quark core and meson cloud contribute to the transition amplitudes. The comparison of theoretical results with experimental data reveals that, rather than the $L = 0$ component of the $\Delta(1232)$ resonance, it is the $L = 2$ component that significantly affects its $S_{1/2}$ amplitude. These findings indicate that the $\Delta(1232)$ resonance likely contains a substantial $L = 2$ component, challenging the conventional view of the $\Delta(1232)$ resonance as an $L = 0$ baryon.

Primary author(s) : Dr KAEWSNOD, Attaphon (Suranaree University of Technology)

Co-author(s) : Dr XU, Kai (Suranaree University of Technology); Dr SANGKHAKRIT, Thanat (Suranaree University of Technology); Dr ZHAO, Zheng (Suranaree University of Technology); Prof. YAN, Yupeng (Suranaree University of Technology)

Presenter(s) : Dr KAEWSNOD, Attaphon (Suranaree University of Technology)

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

Gluon distributions in the proton in a light-front spectator model

I will present a light-front spectator model for the proton that incorporates the gluonic degree of freedom. The model is based on light-front wave functions modeled from the soft-wall anti–de Sitter/QCD prediction, which allows us to explore the gluonic structure within the proton. Using this model, we have successfully predicted key results for gluon transverse momentum distributions (TMDs) and generalized parton distributions (GPDs), providing valuable insights into the behavior of gluons. In this talk, I will discuss gravitational form factors, which are essential for understanding the internal distributions of mass, energy, pressure, and shear within the proton. These form factors offer important information about the mechanical properties of the proton, particularly those related to gluonic interactions. This talk will demonstrate how our model contributes to a deeper understanding of the fundamental forces and distributions that define hadronic matter.

Primary author(s) : Dr CHOUDHARY, Poonam (Indian Institute of Technology Bombay, Mumbai); Prof. CHAKRABARTI, Dipankar (IIT Kanpur); Prof. MUKHERJEE, Asmita (IIT Bombay, Mumbai); Mr GURJAR, Bheemsehan (IIT Kanpur, India)

Presenter(s) : Dr CHOUDHARY, Poonam (Indian Institute of Technology Bombay, Mumbai)

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

Two-pion emission decays of singly heavy baryon

We investigate two-pion emission decays of singly charmed and bottom baryons. Our study includes both sequential decays through intermediate states and direct decays, with coupling constants estimated using the quark model and chiral-partner scheme. Examining recent Belle measurements for $\Lambda_c(2625)^+$, we confirm its assignment as a λ-mode excitation with $J^P = 3/2^-$. We also predict decay patterns for other states. The observed asymmetry in the $\pi\pi$ mass distribution highlights the role of the direct process, reflecting the chiral-partner structure. However, the direct process is less significant in three-body decays unless S-wave resonances are suppressed. Further experiments are needed to test our predictions and explore the structure of heavy baryons.

Primary author(s) : ARIFI, Ahmad Jafar (RIKEN Nishina Center)

Presenter(s) : ARIFI, Ahmad Jafar (RIKEN Nishina Center)

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

New insight into the OZI suppression and the X_0(4140), X_1(4140) and X_1(4685) as hadronic molecules

The coupled channel scattering \{D_s\bar{D}*s,\, J/\psi \phi,\, D_s^{\ast}\bar{D}_s^{\ast}\} involving a dip lineshape is studied in effective range expansion method in B\to D_s\bar{D}_s K, and sheds light on X_0(4140) spectrum. The X_0(4140) corresponds to a pole near J/\psi \phi threshold, where J/\psi \phi scattering length in single channel is (1.11\pm 0.65\,\rm{fm})
extracted, and an effective scattering length is (0.12^{+0.20}{-0.10}+i0.78^{+0.20}_{-0.40} \, \rm{fm}) in the coupled channel scattering. channel scattering. Assuming the spin interaction in J/\psi \phi scattering is negligible, a virtual state near the J/\psi \phi threshold in J^{PC}=1^{++} sector enhances the lineshape in J/\psi \phi invariant mass distribution, and plays a crucial role to pin down the puzzles in X_1(4140) widths. Heavy quark spin symmetry adapts a similar interaction to interpret a molecular \psi(2S)\phi state, X_1(4685). These three states provide a new way to probe OZI suppression in low-energy scattering.

Primary author(s) : Dr YAN, Mao-Jun

Presenter(s) : Dr YAN, Mao-Jun

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

Radiative decays of χ_{c1} states in effective field theory approach

The $\chi_{c1}(3872)$ state, discovered by the Belle, BABAR, CDF, D0, and LHCb collaborations and identified with quantum numbers $J^{PC} = 1^{++}$, has been the subject of extensive study due to its intriguing properties. Various theoretical interpretations, including the $\chi_{c1}(2P)$, the molecular $\bar{D}^*D/\bar{D}D^*$, and compact tetraquark states, have been proposed to explain its unique characteristics. However, challenges remain, particularly regarding its mass coincidence with the threshold and isospin violation, which are difficult to reconcile within both the pure $c\bar{c}$ and compact tetraquark models.

The upgrade of the electron energy to 22 GeV at CEBAF offers a valuable opportunity to address these challenges. This enhancement will enable the measurement of the energy dependence of the production rate, allowing for an in-depth exploration of the production mechanisms of the $\chi_{c1}(1P)$ and $\chi_{c1}(3872)$ states in γ^*p reactions.

In this study, we analyze the radiative decays of the $\chi_{c1}(1P)$ and $\chi_{c1}(3872)$ states using effective field theory, incorporating triangle loops of D and D^* mesons. Model parameters are determined from the observed branching fraction of the radiative decay mode $\chi_{c1}(1P) \to J/\psi\gamma$. The inclusion of triangle loops in theoretical models has the potential to deepen our understanding of the production mechanisms and to clarify the observed properties of these exotic states.

Primary author(s) : Dr SANGKHAKRIT, Thanat (Suranaree University of Technology)

Co-author(s) : Dr KAEWSNOD, Attaphon (Suranaree University of Technology); Dr SUPANAM, Nopmanee (Srinakharinwirot University); Prof. YAN, Yupeng (Suranaree University of Technology)

Presenter(s) : Dr SANGKHAKRIT, Thanat (Suranaree University of Technology)

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

Effective range expansion including the left-hand cut arising from the OPE

The validity range of the time-honored effective range expansion can be very limited due to the presence of a left-hand cut close to the two-particle threshold. Such a left-hand cut arises in the two-particle interaction involving a light particle exchange with a mass small or slightly heavier than the mass difference of the two particles, a scenario encountered in a wide range of systems. This can hinder a precise extraction of low-energy scattering observables and resonance poles. To address this issue, we propose a new parameterization for the low-energy scattering amplitude that accounts for the left-hand cut. The parameterization is like a Pade approximation but with nonanalytic terms from the left-hand cut and can be regarded as an extension of the effective range expansion. It is ready to be applied to a broad class of scatterings and, in particular, should be invaluable in understanding various near-threshold hadron resonances. As byproducts, we also show that the parameterization can be used to extract the couplings of the exchanged particle to the scattering particles, and derive expressions for amplitude zeros caused by the interplay between the short- and long-range interactions.

Primary author(s) : Prof. DU, Meng-Lin (University of Electronic Science and Technology of China); Prof. GUO, Feng-Kun (Institute of Theoretical Physics, CAS); Dr WU, Bing (University of Electronic Science and Technology of China)

Presenter(s) : Prof. DU, Meng-Lin (University of Electronic Science and Technology of China)

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

Correlation function for the bottom system and inverse problem

I will present the work of Phys Rev D 109 (2024) 016014, in which we investigate the correlation functions and inverse problem of determining the low energy observables, including the scattering length and effective range and the molecular probability. The bootstrap method is used to determine these magnitudes with acceptable precision. In addition, the size of the source function from where the correlation functions are measured can be also determined with a high precision.

Primary author(s) : Prof. DAI, LIANRONG

Presenter(s) : Prof. DAI, LIANRONG

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

Correlation function and the inverse problem in the two-body interactions

In our work, we dynamically generate the bound states with the coupled channel approach and evaluate the correlation functions for each channel. Then we address the inverse problem starting from these correlation functions to determine the scattering observables related to the system, including the existence of the bound state and its molecular nature. Assuming the correlation functions obtained from our theoretical results to correspond to real measurements, we make a fit to the data within a general framework to extract the information contained in these correlation functions. The bootstrap method is used to determine the uncertainties of the different observables, and we find that, assuming errors of the same order than in present measurements of correlation functions, one can determine the scattering length and effective range of all channels with a very good accuracy.

Primary author(s) : □, □□ (□□□□□□□)

Co-author(s) : Dr OSET, Eulogio (Institut de Fisica Corpuscular); Prof. LIANG, Wei-Hong

Presenter(s) : □, □□ (□□□□□□□)

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

Is Pc(4457) a positive parity state ?

In this talk, we will make new interpolation of Pc(4457) as a bound state of Dbar Lambda(2595) and it mainly decay to Pc(4312) pi channel.

Primary author(s) : Prof. □□, □ (□□□□□□□□)

Co-author(s) : Dr WU, Jin-zI (George Washington University); Prof. PANG, Jin-Yi (University of Shanghai for Science and Technology)

Presenter(s) : Prof. □□, □ (□□□□□□□□)

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

Machine learning-based line shape analysis of exotic hadron candidates

Most recently discovered exotic hadron candidates appear close to two-hadron thresholds, making it challenging to probe the quantum states associated with these near-threshold signals. This difficulty arises from potential contamination due to coupled-channel effects, and the observed signal might also originate from purely kinematical effects. In this talk, I will discuss how machine learning can supplement conventional line shape analysis. Specifically, I will demonstrate that a deep neural network can be trained to distinguish between enhancements in the observable that result from a dynamical pole and those due to kinematical effects, such as the triangle singularity, even in the presence of experimental uncertainties. Our focus is on interpreting the Pc(4312) state, as observed by LHCb in 2019. After ruling out the triangle singularity interpretation, we examine the pole structure of the Pc(4312) more closely. Interestingly, there are several pole structures that produce nearly identical line shapes. To resolve this ambiguity, we incorporated the off-diagonal elements of the S-matrix into the training dataset used for generating line shapes. Our findings indicate that the experimental data favors a three-pole structure interpretation for the Pc(4312), with one pole in each unphysical Riemann sheet. This pole structure suggests a compact resonance contaminated by the presence of a virtual state in the higher mass channel.

Primary author(s) : SOMBILLO, Denny Lane (University of the Philippines Diliman)

Presenter(s) : SOMBILLO, Denny Lane (University of the Philippines Diliman)

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

Deciphering the mechanism of J/\psi-nucleon scattering

The low-energy $J/\psi N$ scattering is important for various reasons: it is related to the hidden-charm P_c pentaquark states, provides insights into the role of gluons in nucleon structures, and is relevant to the J/ψ properties in nuclear medium. The scattering can happen through two distinct mechanisms: the coupled-channel mechanism via open-charm meson-baryon intermediate states, and the soft-gluon exchange mechanism. We investigate the $J/\psi N$ S-wave scattering length through both mechanisms, and find that the soft-gluon exchange mechanism leads to a scattering length at least one order of magnitude larger than that from the coupled-channel mechanism and thus is the predominant one.
The findings can be verified by lattice calculations and will enhance our understanding of the scattering processes breaking the Okubo-Zweig-Iizuka rule.

Primary author(s) : Dr WU, Bing; Dr DONG, Xiang-Kun; Prof. DU, Meng-Lin; Prof. GUO, Feng-Kun; Prof. ZOU, Bing-Song

Presenter(s) : Dr WU, Bing

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

Exotic structures near D(*)K thresholds

In the last two decades, there are many open and hidden charmed exotics were discoveried. The investigations of their dynamics have been an ongoing and central issue in the study of nonperturbative Quantum Chromodynamics. One of the most popular exotic states is the Ds(2317). The close proximity behavior of them to threshold renders its nature highly susceptible to interactions and the inner structures remain puzzling due to the complexity of the coupled channel effect between the bare core and molecular components. In this talk, I will present our recent investigation on the exotic structures near D(*)K thresholds.

Primary author(s) : YANG, Zhi (University of Electronic Science and Technology of China)

Co-author(s) : WANG, Guang-Juan; WU, Jia-Jun; OKA, Makoto; ZHU, Shi-Lin

Presenter(s) : YANG, Zhi (University of Electronic Science and Technology of China)

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

P-wave molecular resonance: G(3900)

The BESIII Collaboration recently performed a precise measurement of the $e^+e^- \to D\bar{D}$ Born cross sections, and confirmed the $G(3900)$ structure reported by BaBar and Belle with high significance. We identify the $G(3900)$ as the first P-wave $D\bar{D}^*/\bar{D}D^*$ molecular resonance. The experimental and theoretical identification of the P-wave dimeson state holds paramount importance in enhancing our comprehension of the non-perturbative QCD and few-body physics. Its existence is firmly established in a unified meson-exchange model which simultaneously depicts the features of the $\chi_{c1}(3872)$, $Z_c(3900)$ and $T_{cc}(3875)$. The credibility of the investigations is also ensured by the fact that the P-wave interaction dominantly arises from the well-known long-range pion exchange. Additionally, thanks to the centrifugal barrier, it is easier to form resonances in P-wave than in S-wave. We extensively calculate all systems up to P-wave with various quantum numbers and predict a dense population of the $D\bar{D}^*/\bar{D}D^*$ and DD^* states, where the S-wave $D\bar{D}^*/\bar{D}D^*$ state with $I^G(J^{PC}) = 0^-(1^{+-})$, P-wave $D\bar{D}^*/\bar{D}D^*$ state with $I^G(J^{PC}) = 0^+(0^{-+})$, and P-wave DD^* state with $I(J^P) = 0(0^-)$ are more likely to be observed in experiments.

Primary author(s) : LIN, Zi-Yang (Peking University); WANG, Jun-Zhang (Peking university); CHENG, Jian-Bo (China University of Petroleum); MENG, Lu (Ruhr-Universitat Bochum); ZHU, Shi-Lin (Peking University)

Presenter(s) : LIN, Zi-Yang (Peking University)

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

Quark model with hidden local symmetry and its application to the multi quark systems

We propose a chiral quark model that incorporates vector mesons and apply it to the study of the hadron spectrum. We consider the contributions of vector mesons within the framework of hidden local symmetry. Our results demonstrate a significant improvement in the masses of ground state baryons, including the nucleon, Λ_c, and Λ_b. We successfully reproduce the masses of all 45 experimentally confirmed ground states of mesons and baryons. Furthermore, our predictions for 21 ground states align well with the results obtained from lattice QCD analyses. This work represents the first successful achievement of all 45+21 ground states of mesons and baryons using a single set of parameters.

Primary author(s) : HE, BingRan (Nanjing Normal University)

Presenter(s) : HE, BingRan (Nanjing Normal University)

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

he equation of state of the neutron stars with the d*(2380) degree of freedom in a hadronic molecular picture

The WASA-at-COSY Collaboration has confirmed the discovery of d*(2380). This particle has $J^P = 3^+$ quantum number and can be identified as an exotic hadron with an unknown internal structure. Several candidates are proposed for its existence, such as hexaquarks, molecular states, dynamically generated resonances, or kinematic effect (triangle singularity). This work will consider that the d*(2380) is the hadronic molecule composed of the Delta baryon ($J^P = 3/2^+$) bound state. The Weinberg compositeness condition will determine the relevant coupling constants of the Relativistic Mean Field (RMF) Lagragrains involving the d*(2380). The Equation of State (EoS) is also calculated to solve the TOV equation of the neutron stars. Pertinent properties of neutron stars are investigated in our model as well.

Primary author(s) : Dr SAMART, Daris (Khon Kaen University)

Co-author(s) : Mr SAWASDIPOL, Prin (Khon Kaen University); Mr KLANGBURAM, Tanech (Khon Kaen University)

Presenter(s) : Dr SAMART, Daris (Khon Kaen University)

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

Predictions of mass spectra for light hybrid baryons

We study the mass spectra of the nucleon and delta hybrid baryons within the method of parity-projected QCD sum rules. The stable QCD sum rules can be established for the positive-parity $N_{1/2^+}, \Delta_{3/2^+}, \Delta_{1/2^+}$ and negative-parity $N_{1/2^-}, N_{3/2^-}, \Delta_{1/2^-}$ channels to extract their masses. The lowest-lying hybrid baryons are predicted to be the negative-parity $N_{1/2^-}$ state around 2.28 GeV and $\Delta_{1/2^-}$ state around 2.64 GeV. These hybrid baryons mainly decay into conventional baryon plus meson final states. We propose to search for thees hybrid baryons through the χ_{cJ}/Υ decays via the three-gluon emission mechanism in BESIII and BelleII experiments.

Primary author(s) : Prof. CHEN, Wei; Dr WANG, Qi-Nan; LIAN, Ding-Kun; Dr YANG, Hui-Min; Prof. CHEN, Hua-Xing; Prof. HO, Jason; Prof. STEELE, Tom

Presenter(s) : Prof. CHEN, Wei

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

A model study of tetraquark and pentaquark states

Assuming the X(4140) and Pc(4312) to be $cs\bar{c}\bar{s}$ tetraquark and $c\bar{c}uud$ pentaquark states, respectively, we estimate masses of other tetraquark and pentaquark states. Their rearrangement decays are also considered in a simple scheme. Combining information from spectra and widths, we may understand part of observed exotic states in the compact picture.

Primary author(s) : Prof. LIU, Yan-Rui (Shandong University)

Presenter(s) : Prof. LIU, Yan-Rui (Shandong University)

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

Doubly heavy tetraquark bound and resonant states in the quark model

In 2021, the LHCb Collaboration discovered the first doubly charmed tetraquark state $T_{cc}(3875)^+$, which may open a new chapter for the discovery of other doubly heavy exotic states in the future. We investigate the S-wave doubly heavy tetraquark systems, including the $QQ^{(\prime)}\bar{q}\bar{q}$, $QQ^{(\prime)}\bar{s}\bar{q}$, and $QQ^{(\prime)}\bar{s}\bar{s}$ ($Q^{(\prime)} = b, c$ and $q = u, d$) systems, within the constituent quark model. Besides the D^*D molecular bound state as a candidate of $T_{cc}(3875)^+$, we also obtain a series of other bound and resonant states with various configurations, including meson molecules, compact diquark-antidiquark tetraquarks, compact even tetraquarks (QCD analog of hydrogen molecule) and compact diquark-centered tetraquarks (QCD analog of helium atom). The classifications of tetraquarks based on their color-spatial configurations help unravel the rich internal structures and various forming mechanisms of tetraquark states.

Primary author(s) : Mr WU, Wei-Lin (Peking University)

Co-author(s) : Dr MA, Yao (Peking University); Mr CHEN, Yan-Ke (Peking University); Dr MENG, Lu (Ruhr University Bochum); Prof. ZHU, Shi-Lin (Peking University)

Presenter(s) : Mr WU, Wei-Lin (Peking University)

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

Opening speech

Dian-Yong Chen
Southeast University

Session Classification : Plenary session

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

Novel Perspective on Hybrid Mesons

Presenter(s) : ROBERTS, Craig (Nanjing University)

Session Classification : Plenary session

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

Opening Speech

Monday, 9 December 2024 08:30 (15)

Presenter(s) : CHEN, Dian-Yong (Southeast University)

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

Novel Perspective on Hybrid Mesons

Monday, 9 December 2024 08:45 (30)

Presenter(s) : ROBERTS, Craig (Nanjing University)

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

Glueballs in QCD sum rules

Monday, 9 December 2024 10:15 (30)

Presenter(s) : CHEN, Wei (Sun Yat-Sen University)

Contribution ID : **35** Type : **not specified**

Recent exotic states and prospects at Belle and Belle II

Monday, 9 December 2024 09:15 (30)

Presenter(s) : SHEN, Cheng-Ping (Fudan University)

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

Hadronic molecules near thresholds: Tcc and its partners

Monday, 9 December 2024 10:45 (30)

Presenter(s) : YAMAGUCHI, Yasuhiro (Nagoya University)

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

Is Pc(4457) a positive parity state?

Monday, 9 December 2024 11:15 (30)

Presenter(s) : WU, Jia-Jun (University of Chinese Academy of Sciences)

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

P-wave molecular resonance: G(3900)

Monday, 9 December 2024 11:45 (20)

Presenter(s) : LIN, Zi-Yang (Peking University)

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

Search for the light pentaquark in $K^+d \to K^0pp$ reaction at J-PARC

Monday, 9 December 2024 14:00 (30)

Presenter(s) : KIM, Shin Hyung (Kyungpook National University)

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

Reveal short range interactions between u/d quarks in the NN, D03, and D30 systems

Monday, 9 December 2024 14:30 (30)

Presenter(s) : LÜ, Qi-Fang (Hunan Normal University)

Contribution ID : **41** Type : **not specified**

Investigation of helicity amplitudes of N(1520) and N(1535) resonances including pentaquark components

Monday, 9 December 2024 15:00 (25)

Presenter(s) : KAEWSNOD, Attaphon (Suranaree University of Technology)

Contribution ID : **42** Type : **not specified**

Perspective on the pseudoscalar glueball

Monday, 9 December 2024 15:25 (20)

Presenter(s) : CUI, Ya-Qi (Nanjing University)

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

Production of Λc states and DbarN states at EicC and EIC

Monday, 9 December 2024 15:45 (20)

Presenter(s) : QIAO, Kai-Sa (Institute of Theoretical Physics)

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

Exclusive J/ψ photoproduction on nucleon and nuclei

Monday, 9 December 2024 16:25 (30)

Presenter(s) : KIM, Sangho (Soongsil University)

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

Nucleon-charmonium interactions from lattice QCD

Monday, 9 December 2024 16:55 (25)

Presenter(s) : LYU, Yan (RIKEN)

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

Deciphering the mechanism of J/ψ-nucleon scattering

Monday, 9 December 2024 17:20 (25)

Presenter(s) : WU, Bing (University of Electronic Science and Technology of China)

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

On the determination of the D meson width in the nuclear medium with the transparency ratio

Monday, 9 December 2024 17:45 (20)

Presenter(s) : MONTESINOS, Victor (University of Valencia)

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

Coexistence of extended and compact structures: for the case Ω(2012)

Tuesday, 10 December 2024 08:30 (30)

Presenter(s) : ATSUSHI, Hosaka (Osaka University)

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

Identify the two-pole structure from a flavor filter

Tuesday, 10 December 2024 09:00 (30)

Presenter(s) : LIU, Xiao-Hai (Tianjin University)

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

Searching for six quark states in Lattice QCD

Tuesday, 10 December 2024 09:30 (30)

Presenter(s) : LIU, Liuming (Institute of Modern Physics)

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

Study of 1-+ Fully Light, Charmonium-like, and Fully Charm Tetraquark Spectroscopy

Tuesday, 10 December 2024 10:00 (25)

Presenter(s) : ZHAO, Zheng (Suranaree University of Technology)

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

Exotic Hadrons with Two Strange Quarks

Tuesday, 10 December 2024 10:45 (30)

Presenter(s) : AHN, Jung Keun (Korea University)

Contribution ID : **53** Type : **not specified**

Coupled-channel framework for the exotic structures near thresholds

Tuesday, 10 December 2024 11:15 (30)

Presenter(s) : YANG, Zhi (University of Electronic Science and Technology of China)

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

Search for DDbar bound state

Tuesday, 10 December 2024 11:45 (30)

Presenter(s) : WANG, En (Zhengzhou University)

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

A model study of tetraquark and pentaquark states

Tuesday, 10 December 2024 14:00 (30)

Presenter(s) : LIU, Yan-Rui (Shandong University)

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

Light and Hidden-Charm Pentaquark States in Molecular and Pentaquark Pictures

Tuesday, 10 December 2024 14:30 (25)

Presenter(s) : XU, Kai (Suranaree University of Technology)

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

Study of $D^0 \to K^+K^-\eta$ and $\pi^+\pi^-\eta$

Tuesday, 10 December 2024 14:55 (25)

Presenter(s) : RAHMANI, Sara (Hunan Univeristy)

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

Classification of eigenstates in coupled-channel scattering amplitude with the chiral unitary method

Tuesday, 10 December 2024 15:20 (20)

Presenter(s) : NISHIBUCHI, Takuma (Tokyo Metropolitan University)

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

Analysis of the Isovector State of Doubly Heavy Tetraquarks Using Effective Field Theory Respecting Superflavor Symmetry

Tuesday, 10 December 2024 15:40 (20)

Presenter(s) : TANAKA, Mitsuru (Nagoya University)

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

Correlation function for the bottom system and inverse problem

Tuesday, 10 December 2024 16:20 (30)

Presenter(s) : DAI, Lianrong (Huzhou University)

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

Correlation function and the inverse problem in the two-body interactions

Tuesday, 10 December 2024 16:50 (30)

Presenter(s) : XIAO, Chu-Wen (Guangxi Normal University)

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

Doubly heavy tetraquark bound and resonant states in the quark model

Tuesday, 10 December 2024 17:20 (20)

Presenter(s) : WU, Wei-Lin (Peking University)

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

Properties of X(3872) from hadronic potentials coupled to quarks

Tuesday, 10 December 2024 17:40 (20)

Presenter(s) : TERASHIMA, Ibuki (Tokyo Metropolitan University)

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

Heavy pentaquarks with multi-strangeness

Wednesday, 11 December 2024 08:30 (30)

Presenter(s) : KIM, Hyun-Chul (Inha University)

Contribution ID : **65** Type : **not specified**

The pole structures of the X(1840)/X(1835) and the X(1880)

Wednesday, 11 December 2024 09:00 (30)

Presenter(s) : WANG, Qian (Huanan Normal University)

Contribution ID : **66** Type : **not specified**

Global coupled-channel analysis of ee -> ccbar data

Wednesday, 11 December 2024 09:30 (30)

Presenter(s) : NAKAMURA, Satoshi (Shandong University)

Contribution ID : **67** Type : **not specified**

New insight into the OZI suppression and the X0(4140), X1(4140) and X1(4685) as hadronic molecules

Wednesday, 11 December 2024 10:00 (30)

Presenter(s) : YAN, Mao-Jun (Southwest University)

Contribution ID : **68** Type : **not specified**

The equation of state of the neutron stars with the d*(2380) degree of freedom in a hadronic molecular picture

Wednesday, 11 December 2024 10:50 (30)

Presenter(s) : SAMART, Daris (Khon Kaen University)

Contribution ID : **69** Type : **not specified**

Two-pion emission decays of singly heavy baryon

Wednesday, 11 December 2024 11:20 (25)

Presenter(s) : ARIFI, Ahmad Jafar (RIKEN)

Contribution ID : **70** Type : **not specified**

Dynamical generation of hidden-charm meson states in heavy meson scattering

Wednesday, 11 December 2024 11:45 (25)

Presenter(s) : KIM, Hee-Jin (Inha University)

Contribution ID : **71** Type : **not specified**

Study of the decay width of Tcc tetraquark based on a quark model

Wednesday, 11 December 2024 14:00 (30)

Presenter(s) : HARADA, Masayasu (Nagoya University)

Contribution ID : **72** Type : **not specified**

Exploring the two-body strong decay properties of the possible $\Lambda_c K^*$ and $\Sigma_c K^{(*)}$ molecules

Presenter(s) : CHEN, Rui (Hunan Normal University)

Contribution ID : **73** Type : **not specified**

Radiative Decays of χc1 States in the Effective Field Theory Approach

Wednesday, 11 December 2024 14:30 (25)

Presenter(s) : SANGKHAKRIT, Thanat (Suranaree University of Technology)

Contribution ID : **74** Type : **not specified**

The production and decay of X(3872) related to B meson

Wednesday, 11 December 2024 15:15 (20)

Presenter(s) : WANG, Han-Nan (Institute of Modern Physics)

Contribution ID : **75** Type : **not specified**

Three- and four-lepton bound and resonant states

Wednesday, 11 December 2024 15:35 (20)

Presenter(s) : MA, Yao (Peking University)

Contribution ID : **76** Type : **not specified**

Quark model with hidden local symmetry and its application to the multi quark systems

Wednesday, 11 December 2024 16:15 (30)

Presenter(s) : HE, Bing-Ran (Nanjing Normal University)

Contribution ID : **77** Type : **not specified**

Effective range expansion including the left-hand cut arising from the OPE

Wednesday, 11 December 2024 16:45 (30)

Presenter(s) : DU, Meng-Lin (University of Electronic Science and Technology of China)

Contribution ID : **78** Type : **not specified**

Machine learning-based line shape analysis of exotic hadron candidates

Wednesday, 11 December 2024 17:15 (30)

Presenter(s) : SOMBILLO, Denny Lane (University of the Philippines)

Contribution ID : **79** Type : **not specified**

Closing remarks

Wednesday, 11 December 2024 17:45 (10)

Presenter(s) : ATSUSHI, Hosaka (Osaka University)

Contribution ID : **80** Type : **not specified**

pΩ interaction and correlation function

Wednesday, 11 December 2024 14:55 (20)

Presenter(s) : YAN, Ye (Nanjing Normal University)