NSTAR 2015

Monday 25 May 2015 - Thursday 28 May 2015

Icho Kaikan, Suita Campus, Osaka University

Programme

Table of contents

Monday 25 May 2015

Plenary: 25-1 / Chair: Atsushi Hosaka - Main Hall (09:20-11:00)

time	title
09:20	**Opening** *Presenter: Prof. NAKANO, Takashi (RCNP, Osaka University)*
09:30	**N* Physics with Meson Photoproduction at CLAS** *Presenter: Prof. IRELAND, David (University of Glasgow)* A great deal of information on the spectrum of baryons can be obtained from meson photoproduction experiments. This talk will present an overview of the many results published by the CLAS collaboration, including both cross-sections and polarisation observables. These results will be compared with existing and complementary data sets from other labs, and their influence on theoretical models will be examined. What we have learned so far, and the prospects for obtaining amplitude level information through "complete" experiments will also be discussed.
10:00	**Light-quark baryon spectroscopy from ANL-Osaka dynamical coupled-channels analysis** *Presenter: Dr. KAMANO, Hiroyuki (RCNP)* I overview our recent efforts on determining the resonance parameters associated with light-quark baryons by making use of the ANL-Osaka dynamical coupled-channels approach. I mainly focus on talking about the spectroscopy of nonstrange N and Delta baryons and S=-1 Lambda and Sigma baryons.
10:30	**Recent results from the CBELSA/TAPS experiment at ELSA** *Presenter: Dr. THIEL, Annika (HISKP, University of Bonn)* In order to understand the dynamics inside the nucleon, the excitation spectrum needs to be measured and compared to theoretical models like constituent quark models. Until now, several predicted resonances have not been found by experiments, which is the well-known {\it missing resonances} problem. Since the excitation spectrum of the nucleon consists of several strongly overlapping resonances, the resonances are difficult to disentangle and identify. To determine their exact contributions, a solution of the partial wave analysis has to be found. For a complete experiment, which leads to an unambiguous solution, at least 8 well-chosen single and double polarization observables are needed. With the Crystal-Barrel/TAPS experiment at ELSA, the measurement of several single and double polarization parameters in di erent reactions is possible by using a circularly or linearly polarized photon beam on a longitudinally or transversally polarized butanol target. The Crystal-Barrel/TAPS setup provides a nearly 4 angular coverage and a high detection efficiency for neutral states, which gives an ideal condition for the study of nal state comprising neutral mesons. In this talk results of di erent polarization observables for single and double meson photoproduction will be presented. Additionally, the rst impact of the new polarization data will be shown. Supported by the DFG (SFB/TR16).

Plenary: 25-2 / Chair : Ralf Gothe - Main Hall (11:30-13:00)

time	title
11:30	**Exciting Baryons at MAMI** *Presenter: Prof. OSTRICK, Michael (University Mainz)* Recent results on polarised pion and eta photoproduction obtained at the Mainz Microtron MAMI will be presented. The new data will allow us to perform a model independent baryon resonance analyses from single energy partial wave amplitudes up to 2 GeV center of mass energy. The strategy, our preliminary results and the future perspectives will be discussed.
12:00	**Properties of baryons from the Bonn-Gatchina partial wave analysis.** *Presenter: Dr. SARANTSEV, Andrey (HISKP Uni-Bonn and PNPI, NRC "Kurchatov Institute")* The latest results from the combined analysis of the meson photo-production and pion-induced data are presented. The fitted data base includes the latest data from the CLAS, CB-ELSA, MAMI and HADES collaborations on reactions with KLambda, KSigma, omega-p, K*Lambda and Npipi final states. The analysis reveals signals from resonances which were not seen before in our analysis and provided strong restrictions for properties of some states which are not confirmed by the new data.
12:30	**Baryon resonances in a combined analysis of pion- and photo-induced reactions - recent results from the Juelich PWA** *Presenter: Dr. RÖNCHEN, Deborah (Helmholtz-Institut fuer Strahlen- u. Kernphysik, Bonn University)* In order to connect predictions of the baryon spectrum in the non-perturbative regime from quark models or lattice calculations to experimental data, a framework especially suited is given by the so-called dynamical coupled-channel (DCC) models. In those approaches, a simultaneous partial-wave analysis of multiple reactions with different initial and final states is performed, which provides the chance to find states not seen in elastic πN scattering. The Juelich model is a DCC approach which preserve unitarity and analyticity. The latter is a prerequisite for the extraction of resonance parameters in terms of pole positions and residues. We present recent results of a simultaneous study of several pion-induced reactions together with pion and η photoproduction. Based on the analysis of more than 36,000 data points we studied the influence of new double-polarization measurements on the extracted resonance parameters.

Parallel-A: 25-1 / Chair : Tetsuo Hyodo - Main Hall (14:30-16:00)

time	title
14:30	**The DMT dynamical model for pion-nucleon scattering and pion electromagnetic production** *Presenter: Prof. YANG, Shin Nan (National Taiwan University)* The Dubna-Mainz-Taipei (DMT) dynamical model is a meson-exchange model for pion-nucleon scattering and pion electromagnetic (EM) production. We will first present the predictions of the DMT model for the threshold production and compare them with the recent measurements from MAMI and Hall A/Jlab. Then the resonance properties extracted from pion-nucleon scattering and pion EM production with DMT model will be summarized. The data analyzied cover from threshold up to c.m. energies $W \le 2 $ GeV. The properties extracted include masses, widths, pole positions, as well as the deformation of $\Delta (1232)$.
15:00	**Polarized Photon Beams for the BGO-OD Experiment at ELSA *** *Presenter: Mr. ZIMMERMANN, Thomas (Physikalisches Institut, Universität Bonn)* The new BGO-OD experiment, located at the electron accelerator ELSA at the University of Bonn, is designed to study nucleon excitations with emphasis on understanding the reaction dynamics. It consists of a central BGO calorimeter with a magnetic spectrometer in forward directions. The physics program includes the measurement of polarization observables which requires linearly and circularly polarized photons beams. Both are produced by bremsstrahlung. Linear polarization is obtained by coherent bremsstrahlung off a diamond crystal, circular polarization from an amorphous radiator using longitudinally polarized electrons. The degree of polarization of the linearly polarized photon beam is determined by an analytic investigation of the photon spectrum. To determine the polarization of the circularly polarized photon beam the polarization of the electron beam is measured by an Møller polarimeter. This talk will review the current status of the experiment including beam polarimetry and present first results of polarization observables in eta and pion photo production. * Supported by DFG / SFB-TR16
15:20	**Strangeness photoproduction at the BGO-OD experiment** *Presenter: Dr. JUDE, Thomas (Bonn University)* The BGO-OD experiment at the ELSA accelerator facility uses an energy tagged bremstrahlung photon beam to investigate the internal structure of the nucleon. The setup consists of a highly segmented BGO calorimeter surrounding the target, with a particle tracking magnetic spectrometer at forward angles. The extensive physics programme includes measurements of cross sections and polarisation observables for vector and pseudoscalar mesons, and in-medium modification of mesons investigated using nuclear targets. This talk however will focus on associated strangeness photoproduction measurements. The BGO-OD is ideal for investigating the photoproduction of hadrons of non-zero strangeness. The high momentum resolution at forward angles covers a kinematic region where t-channel exchange mechanisms play a dominant role. This is complemented by the neutral and charged particle identification in the BGO calorimeter for the identification of hyperon decays. The first part of the strangeness programme includes measurements of the differential cross section at forward angles for $\gamma p \rightarrow K^+ \Lambda$ and, using linearly polarised photons, the beam asymmetry, Σ, for $\gamma p \rightarrow K^0 \Sigma^+$. This latter measurement focuses on the K^* threshold region where a cusp-like structure was recently observed in the total cross section. Analysis of these reaction channels for simulated and very first real data is presented. Supported by DFG (SFB/TR-16).

15:40 **Baryon resonances in strangeness production**

Presenter: Dr. XIE, Ju-Jun (Institute of Modern Physics, Chinese Academy of Sciences)

Firstly, we study the $N^\ast(2120) D_{13}$ resonance in the $\gamma p \to K^+ \Lambda(1520)$ reaction taking into account the LEPS and CLAS differential cross section data. In addition to the contact, t-channel $\bar K$ exchange, u-channel $\Lambda(1115)$ hyperon pole term, s-channel nucleon pole and $N^\ast(2120)$ [previously called $N^\ast(2080)$] resonance contributions. It is shown that when the contributions from the $N^\ast(2120)$ resonance and the $\Lambda(1115)$ hyperon are taken into account, both the new CLAS and the previous LEPS data can be simultaneously described.

Secondly, within the effective Lagrangian method, we investigate the $\Sigma(1385)$ (spin-parity $J^P = 3/2^+$) hadronic production in the $\pi^+ p \to K^+ \Sigma^+(1385)$ and $p p \to n K^+ \Sigma^+(1385)$ reactions. We show that the inclusion of the $\Delta^\ast(1940)$ resonance leads to a fairly good description of the low energy experimental total cross section data of those two reactions. We calculate the total and differential cross sections of the $p p \to n K^+ \Sigma^+(1385)$ reaction. It is
shown that the new experimental data support the important role played by the $\Delta^\ast(1940)$ resonance with a mass in the region of 1940 MeV and a width of around 200 MeV. We also demonstrate that the invariant mass distribution and the Dalitz Plot provide direct information of the $\Sigma^+(1385)$ production, which can be
tested by future experiments.

Thirdly, we study the $\Lambda p \to \Lambda p \pi^0$ reaction near threshold within an effective Lagrangian method. The production process is described by single-pion and single-kaon exchange. In addition to the role played by the $\Sigma^\ast(1385)$ resonance of spin-parity $J^P = 3/2^+$, the effects of a newly proposed $\Sigma^\ast$ ($J^P = 1/2^-$) state with mass and width around 1380 MeV and 120 MeV are investigated. We show that our model leads to a good description of the experimental data on the total cross section of the $\Lambda p \to \Lambda p \pi^0$ reaction by including the contributions from the possible $\Sigma^\ast(\frac{1}{2}^-)$ state. However, the theoretical calculations by considering only the $\Sigma^\ast(1385)$ resonance fail to reproduce the experimental data, especially for the enhancement close to the reaction threshold. We also demonstrate that the angular distributions provide direct information of this reaction, hence could be useful for the investigation of the existence of the $\Sigma^\ast(\frac{1}{2}^-)$ state and may be tested by future
experiments.

Parallel-B: 25-1 / Chair : Hideko Nagahiro - Room 1 (14:30-15:40)

time	title
14:30	**Dibaryons from WASA-at-COSY** *Presenter: Dr. BASHKANOV, Mikhail (University of Tuebingen)* Despite their long painful history dibaryon searches (where dibaryon means a baryon number B = 2 state independently on the internal structure: genuine six-quark state/baryonic-molecule) have recently received new interest, in particular by the recognition that there are more complex quark configurations than just the familiar quark-antiquark and qqq systems. A resonance like structure recently observed in double-pionic fusion to deuteron, at M = 2.38 GeV with 70 MeV width and I(Jp) = 0(3+) meanwhile proved to be the so-called inevitable dibaryon d*(2380). To investigate its structure we have measured its decay branches into the dπ^0 π^0, dπ^+ π^-, ppπ^- π^0, pnπ^0 π^0 and pn channels by pd and dp collisions in the quasi-free reaction mode, utilizing the WASA detector setup at COSY. The pn decay channel was measured by use of polarized deuterons in inverse kinematics. These new np analyzing power data exhibit a pronounced resonance effect in their energy dependence. The SAID partial-wave analysis with inclusion of these data reveals a pole in the complex plane of the 3D3-3G3 partial waves at (2380±10)MeV –i(40±5)MeV in accordance with the d* resonance hypothesis. Further investigations on the internal structure of the d* dibaryon, the SU(3) multiplet companions as well as the mirror partners are expected to be done in near future. First results in search for the d* mirror state with electric charge Z=+4 performed by Wasa collaboration will be presented. Other future dibaryon initiatives to be done at MAINZ, J-PARC and PANDA will be discussed.
15:00	**$d^\ast(2380)$ in a chiral quark model** *Presenter: HUANG, Fei (University of Chinese Academy of Sciences)* The structure and decay of $d^\ast$ has been studied in a chiral quark model. By performing an elaborate dynamical coupled-channels investigation of the $\Delta\Delta$-CC (hidden-color channel) system within the framework of resonating group method (RGM), we found that the $d^\ast$ state has a mass around 2.38-2.42 GeV and a width around 60-70 MeV, which are both consistent with the data reported recently by the WASA-at-COSY Collaboration. Our results show that the $d^\ast$ state has a CC fraction of about $2/3$, which supports the scenario that $d^\ast$ is a hexaquark dominated exotic state.
15:20	**Hyperon resonance Lambda(1405) and the K-pp three-body resonance** *Presenter: Dr. DOTE, Akinobu (IPNS/KEK)* Hyperon resonances (Y*) as well as nucleon resonances (N*) are interesting topics in hadron physics. Recently, molecular states appeared in hadron excited states have often been discussed. The excited hyperon Lambda(1405) is a typical example of such hadron molecular states, which is considered to be a quasi-bound state of Kbar meson and a nucleon. Since the two-body system of Kbar and N forms a quasi-bound state, three-body system of Kbar and two nucleons are also expected to form similarly a quasi-bound state, and it would be an entrance to nuclear many-body systems involving Kbar mesons (so-called kaonic nuclei). An early study based on a phenomenological KbarN potential suggested that kaonic nuclei could form highly dense state due to the strong KbarN attraction. To reveal the nature of the interesting system of kaonic nuclei, we are investigating the K-pp system (two protons with a K-meson) which is the most essential system of kaonic nuclei. The K-pp is expected to be a resonance state according to many earlier studies, and the Kbar-N is known to couple strongly with pi-Y. We have proposed the coupled-channel complex scaling method combined with Feshbach method (ccCSM+Feshbach method) to treat adequately and effectively these two ingredients. In this talk, we will report the results of Lambda(1405) (= KbarN resonance) and three-body resonance of K-pp investigated with the ccCSM+Feshbach method using a chiral SU(3) theory-based KbarN-piY potential. References: [1] A. Dote, T. Inoue and T. Myo, Nucl. Phys. A 912 (2013) 66. [2] A. Dote and T. Myo, Nucl. Phys. A 930 (2014) 86. [3] A. Dote, T. Inoue and T. Myo , arXiv:1411.0348, to appear in Prog. Theor. Exp. Phys.

Parallel-C: 25-1 / Chair : Vladimir Pascalutsa - Room 2 (14:30-16:00)

time	title
14:30	**Stability of the pion beyond the chiral limit** *Presenter: Prof. KIM, Hyun-Chul (Inha University)* We present the results of a recent work on the stability of the pion beyond the chiral limit, based on the chiral quark model. We first have computed the energy-momentum tensor form factors of the pion. Then, we have considered the matrix element of the spatial components of the energy-momentum tensor. It was shown that the pressure of the pion vanishes through the Gell-Mann-Oakes-Renner relation, which is different from that in the chiral limit, where the pressure of the pion trivially vanishes. In addition, we also discuss the energy-momentum tensor form factors of the pion and the relevant transverse charge densities.
15:00	**Deeply virtual Compton scattering from the neutron: measurements with CLAS and CLAS12 at Jefferson Lab** *Presenter: Dr. SOKHAN, Daria (University of Glasgow)* Electron scattering from a nucleon is a powerful tool to reveal its internal structure and has the power to answer such questions as what is the composition of nucleon spin. Generalised Parton Distributions (GPDs), for example, relate the longitudinal momentum carried by quarks to their transverse position. The "golden channel" for extracting GPDs is deeply virtual Compton scattering (DVCS), a process in which a high energy electron scatters from an individual quark within a nucleon and a high energy photon is emitted as a result. The scattering amplitude can be described in terms of four complex GPD functions: E, $\tilde{E}$, H and $\tilde{H}$. To achieve flavour-separation of the GPDs, measurements of DVCS off both the proton and neutron are required. Moreover, DVCS is variously sensitive to the real and imaginary parts of the GPDs depending on the polarisation states of the electron and target nucleon. Jefferson Laboratory, USA, is nearing the end of its 12 GeV upgrade, a part of which was the construction of new detectors for CLAS12 in experimental hall B. The experimental programme of CLAS12, which will receive an 11 GeV electron beam, will concentrate mainly on nucleon structure experiments, including the measurement of neutron DVCS with polarised beams. The beam-spin asymmetry in this reaction is dominated by the imaginary part of E, the least constrained of the GPDs, which is related to the orbital angular momentum of quarks in the nucleon. An exclusive reconstruction of the reaction will be made possible by a specially designed neutron detector, the construction of which has just been completed. We present the experimental programme for DVCS measurements off the neutron with CLAS12 and the preliminary results from a measurement of beam-spin and (previously unmeasured) target-spin asymmetries in neutron-DVCS from a CLAS experiment using a ~6 GeV beam and a polarised ND_3 target.
15:20	**K \to \pi transition generalized from factors and transverse quark spin density from the instanton vacuum** *Presenter: SON, Hyeon-Dong (Inha University)* We investigate the vector and tensor generalized form factors for the $K \to \pi$ transition, based on the nonlocal chiral quark model from the instanton vacuum. The transition tensor form factor shows good agreement with recent lattice QCD data. The transverse quark spin density of the $K \to \pi$ transition is also discussed.
15:40	**Nucleon structure functions at small x via holographic Pomeron exchange** *Presenter: WATANABE, Akira (Institute of Physics, Academia Sinica)* We present analysis on nucleon structure functions at small Bjorken x in the framework of holographic QCD. In this study, we improve the description of the target nucleon in the current setup of the holographic model by introducing a soft-wall AdS/QCD model, in which the AdS geometry is smoothly cut off at the infrared boundary. It is known that the correct Regge behavior for various hadrons can be reproduced in the soft-wall models. Combining the improved Pomeron-nucleon coupling and the wave function of the 5D U(1) vector field with the Pomeron exchange kernel, which was proposed by Brower, Polchinski, Strassler, and Tan, we obtain the structure functions. Here we focus on the nonperturbative kinematical region, where $10^{-6} \leq x \leq 10^{-2}$ and $Q^2 \le$ a few (GeV^2), and show that our calculations for F_2 and F_L are consistent with experimental data of the deep inelastic scattering at HERA. Bjorken x and Q^2 dependencies of the longitudinal-to-transverse ratio of the structure functions, F_L/F_T, and feasibility of applications to other high energy scattering processes in this framework will also be discussed.

Parallel-A: 25-2 / Chair : Hajime Shimizu - Main Hall (16:30-17:30)

time	title
16:30	**Measurements of spin observables in single pion photo-production from polarized neutrons in solid HD** *Presenter: KAGEYA, Tsuneo (Thomas Jefferson National Accelerator Facility)* Recent Lattice QCD calculations have supported the long standing quark model expectation of many more excited states of the nucleon than have been experimentally observed. Searches for such "missing states" require detailed partial wave analyses of many polarization observables. Furthermore, the separation of isoscalar and isovector couplings to isospin 1/2 resonances requires information from both proton and neutron reactions. The present data base of neutron reactions is very sparse. To address this shortfall, the Jlab g14/E06-101 experiment collected data during 2011-2012 using the CLAS with circularly and linearly polarized photons incident on longitudinally polarized Deuterons in frozen-spin targets of solid Hydrogen-Deuteride (HD). Studies of experimental and theoretical methods that infer "free neutron" spin observables from deuteron data are ongoing. Preliminary results for the single pion channel, $\gamma + n\,(p) \rightarrow \pi^- + p\,(p)$, will be discussed. Beam-target helicity asymmetries (E) have been extracted from data with circularly polarized photons, and these reveal distinctively different features from the corresponding reactions on polarized protons. The linearly polarized beam asymmetry (Σ) and the double-polarization asymmetry (G) for the π^- p channel are also under study.
16:50	**Polarization observables for double charged pion and vector meson photoproduction from polarized HD target at CLAS** *Presenter: Dr. ZONTA, Irene (University of Rome Tor Vergata and INFN Roma Tor Vergata)* Constituent Quark Models and recent Lattice QCD calculations predict an excited baryon spectrum much richer than the one experimentally observed, the so-called missing resonances problem. These missing states may be revealed by partial wave analysis of not yet measured polarization observables. The CLAS g14/E06-101 (HDice) experiment is part of the N^{*} spectroscopy program at Jefferson Laboratory: it has taken photoproduction data using both circularly- and linearly- polarized photons in the photon energy range up to 2.5 GeV impinging on a longitudinally-polarized Hydrogen-Deuteride (HD) frozen spin target, where both the proton and the neutron are polarized. We present results on the beam-helicity asymmetry $I^{\odot}$, for the double charged pion photoproduction on both proton and neutron targets and and the helicity difference $P_{z}^{\odot}$ on the proton target. Preliminary results on the double polarization observable E for the photoproduction of the ρ vector meson on the proton will be also discussed.
17:10	**Measurement of the beam asymmetry in pion- and eta-photoproduction** *Presenter: Ms. AFZAL, Farah Noreen (University of Bonn)* The study of pseudoscalar meson photoproduction off the proton is an important tool to investigate the proton excitation spectrum which is not well understood, especially at the high mass region. In order to disentangle all contributing resonances and to find an unambiguous partial wave analysis solution in pseudoscalar meson photoproduction, all single and several, well chosen double polarization observables need to be measured in addition to the unpolarized cross section. The CBELSA/TAPS experiment at the electron stretcher accelerator ELSA is well suited for this purpose since a transversely or longitudinally polarized butanol target and a linearly or circularly polarized photon beam are available. Furthermore, it is equipped with two electromagnetic calorimeters which cover almost the full 4π angular range and are highly efficient at detecting photons and thus neutral mesons in the final state. Using a linearly polarized photon beam with a liquid hydrogen target, the beam asymmetry Σ is accessible. In this talk, preliminary results for the beam asymmetry in π^0- and η-photoproduction will be presented in the energy range of 1100 MeV - 1800 MeV. Supported by the Deutsche Forschungsgemeinschaft (SFB/TR16).

Parallel-B: 25-2 / Chair : Michael Döring - Room 1 (16:30-17:20)

time	title
16:30	**Electromagnetic form factors of the octet baryons from lattice QCD** *Presenter: SHANAHAN, Phiala (The University of Adelaide)* I will present the results of recent lattice simulations of the electromagnetic form factors of the octet baryons from the CSSM/QCDSF-UKQCD collaborations. The focus will be on the analysis of those results using techniques to approach the infinite volume limit and the physical pseudoscalar masses at non-zero momentum transfer. The extrapolated proton and neutron form factors are found to be in excellent agreement with those extracted from experiment. Given the success of these calculations, I will describe how the strange electromagnetic form factors may be estimated from these results under the same assumption of charge symmetry used in experimental determinations of those quantities. Motivated by the necessity of that assumption, I will explore a method for determining the size of charge symmetry breaking effects using the same lattice results.
17:00	**Proton pair production cross sections at BESIII** *Presenter: Ms. ZHOU, Xiaorong (University of Science and Technology of China)* Using data samples collected with the BESIII detector at the BEPCII collider, we measured the Born cross section of e+e- -> ppbar at 12 center-of-mass energies from 2232.4 to 3671.0 MeV. The corresponding effective electromagnetic form factor of the proton is deduced by assuming the electric and magnetic form factors to be equal (|GE| = |GM|). Moreover, the ratio of electric to magnetic form factors, |GE|=|GM|, and |GM| are extracted by fitting the distribution of the polar angle of the proton for the data samples with larger statistics, namely at sqrt(s) = 2232.4 and 2400.0 MeV and a combined sample at sqrt(s) = 3050.0, 3060.0 and 3080.0 MeV, respectively. The measured cross sections are in agreement with recent results from BaBar, improving the overall uncertainty by about 30%. The |GE|=|GM| ratios are close to unity and consistent with BaBar results at the same q2 region, which indicates the data are consistent with the assumption that |GE| = |GM| within uncertainties.

Tuesday 26 May 2015

Plenary: 26-1 / Chair : Makoto Oka (09:30-11:00)

time	title
09:30	**Pion photo- and electroproduction and the chiral MAID interface** *Presenter: Prof. SCHERER, Stefan (Johannes Gutenberg University Mainz)* We discuss the extended on-mass-shell scheme for manifestly Lorentz-invariant baryon chiral perturbation theory. We present a calculation of pion photo- and electroproduction up to and including order q^4. The low-energy constants have been fixed by fitting experimental data in all available reaction channels. Our results can be accessed via a web interface, the so-called chiral MAID (http://www.kph.uni-mainz.de/MAID/chiralmaid).
10:00	**Nucleon Electroexcitation and Baryon Structure with CLAS** *Presenter: GOTHE, Ralf (University of South Carolina)* Meson-photoproduction measurements and their reaction-amplitude analyses can establish more sensitively, and in some cases in an almost model-independent way, the nucleon excitations and non-resonant reaction amplitudes. However, to investigate the strong interaction from explored – where meson-cloud degrees of freedom contribute substantially to the baryon structure – to still unexplored distance scales – where quark degrees of freedom dominate and the transition from dressed to current quarks occurs – we depend on experiments that allow us to measure observables that are probing this evolving non-perturbative QCD regime over its full range. Transition form factors are uniquely suited to trace this evolution by measuring exclusive single-meson and double-pion electroproduction cross sections off the free proton. Recent efforts try to include their isospin dependence by analyzing the cross sections off the quasi-free neutron and proton in Deuterium. In the near future, these exclusive measurements will be extended to higher momentum transfers with the energy-upgraded CEBAF beam and CLAS12 to study the quark degrees of freedom, where their strong interaction is responsible for the ground and excited nucleon state formations. Recent results will demonstrate the status of the analysis and of their theoretical descriptions, and an experimental and theoretical outlook will highlight what shall and may be achieved in the new era of the 12-GeV upgraded transition form factor program. 1. This work is supported in part by the National Science Foundation under Grant PHY1205782. 2. Studies of Nucleon Resonance Structure in Exclusive Meson Electroproduction, Int. J. Mod. Phys. E22 (2013) 1330015.
10:30	**Photoproduction for N^{*} and related topics at LEPS/LEPS2** *Presenter: Dr. HIDEKI, Kohri (RCNP, Osaka University)* Meson photoproduction is a powerful tool to obtain a deeper insight into nucleon resonances. Since some of missing nucleon resonances are expected to decay strongly to strangeness channels, we have been studying kaon photoproduction, such as γ p $\rightarrow$ $K^{+}\Lambda$, $K^{+}\Sigma^{0}$, $K^{+}\Sigma^{0}$(1385), $K^{+}\Lambda$(1405), $K^{+}\Lambda$(1520), and γ n $\rightarrow$ $K^{+}\Sigma^{-}$, $K^{+}\Sigma^{-}$(1385) at E_{γ}=1.5-3.0 GeV at the LEPS facility of SPring-8. Non-strange meson photoproduction of γ p $\rightarrow$ πN, $\pi\Delta$, ηp, ωp, ϕp, $\eta' p$ has also been studied. Linearly polarized photon beams produced from backward-Compton scattering enable us to measure photon beam asymmetry which is very sensitive to the existence of nucleon resonances. In order to obtain further information on the meson photoproduction, we have been developing a polarized hydrogen-deuteride(HD) target. The polarized HD targt, linearly or circularly polarized photon beams, and a newly constructed LEPS2 facility with a large acceptance spectrometer will enable us to measure rich physics observables for various meson photoproduction in the near future. We report recent physics results and present status of developments.

Plenary: 26-2 / Chair : Bingsong Zou (11:30-13:00)

time	title
11:30	**Hadron physics from BESIII** *Presenter: Prof. MARCELLO, Simonetta (Torino University and INFN)* BESIII experiment hosted at the BEPCII electron-positron collider at IHEP Beijing in China, designed to provide an instant luminosity up to 10^33cm^–2s^–1, has been running since 2009 at c.m. energies between 2 and 4.6 GeV/cˆ2. An overview of the BESIII recent experimental results, posing more emphasis on Hadron Form Factors, on the relative phase between the strong and the e.m. amplitudes, resonant and non resonant, in the J/Psi decays, on Meson and Baryon Spectroscopies and on XYZ states, will be the subject of the talk.
12:00	**Overview of the latest QM results on the Nstar** *Presenter: Prof. SANTOPINTO, Elena (INFN and Genoa University)* A general overview of the latest results on spectroscopy and structure of the Nstar states will be provided.
12:30	**N* Spectroscopy from Lattice QCD** *Presenter: Prof. LEINWEBER, Derek (University of Adelaide)* This presentation will focus on the low-lying even- and odd-parity excitations of the nucleon obtained in today's lattice QCD calculations. Commencing with a survey of the literature we'll see how results for the first even-parity excitation energy can differ by as much as 1 GeV, a rather unsatisfactory situation. Following a brief review of the methods used to isolate excitations of the nucleon in lattice QCD, and drawing on recent advances, we'll see how a consensus on the low-lying spectrum has emerged among many different lattice groups. To provide insight into the nature of these states we'll explore the wave functions and electromagnetic form factors that are available for a few of these states. Having reviewed the status of lattice QCD calculations, we'll turn our attention to connecting the finite-volume results of lattice QCD to the infinite-volume results of Nature. Drawing on recent results for the Lambda(1405) resonance, the Matrix Hamiltonian implementation of chiral effective field theory will be introduced. Consistent with the Luscher formalism for extracting phase shifts from finite volume spectra, the Hamiltonian approach can provide guidance on the manner in which physical quantities manifest themselves in the finite volume of the lattice. With this insight, we will answer the question; Have we seen the Roper in lattice QCD?

Parallel-A: 26-1 / Chair : Hideki Kohri (14:30-16:00)

time	title
14:30	**Electromagnetic Production of Kaon with Spins 3/2 and 5/2 Nucleon Resonances** *Presenter: Prof. MART, Terry (Universitas Indonesia)* After finishing an investigation of kaon photoproduction processes near their thresholds \[1], we investigate kaon photoproduction on the proton, $\gamma + p \to K^+ +\Lambda$, by means of a covariant isobar model that includes spins 3/2 and 5/2 nucleon resonances with the total c.m. energies up to 2.8 GeV. All relevant nucleon resonances listed in the latest PDG review \[2] are taken into account. Two different prescriptions for the spin 3/2 and spin 5/2 formalism are compared. The unknown coupling constants are extracted by fitting the calculated cross section and polarization observables to the experimental data. To this end, more than 7400 data points have been used in the fitting data base. Result of this investigation is depicted in Fig. 1, where we compare the calculated total cross section obtained from Kaon-Maid \[3] and those obtained from different prescriptions of spin 3/2 and 5/2 amplitudes (models A, B, C, and D), with the experimental data. ![Total cross section][1] **Figure 1:** Calculated total cross sections obtained from Kaon-Maid \[3] and from different prescriptions of spin 3/2 and 5/2 amplitudes (models A, B, C, and D), compared with the experimental data from the CLAS collaboration \[4]. Note that the experimental data shown in this figure are not included in the fitting database. **References** 1. T. Mart, Phys. Rev. C **82**, 025209 (2010); **83**, 048203 (2011); **90**,065202 (2014). 2. K. A. Olive *et al*. [Particle Data Group Collaboration], Chin. Phys. C **38**, 090001 (2014). 3. T. Mart and C. Bennhold, Phys. Rev. C **61**, 012201 (1999). 4. R. Bradford *et al*. [CLAS Collaboration], Phys. Rev. C **73**, 035202 (2006). [1]: http://staff.fisika.ui.ac.id/tmart/kltot.jpg [2]: http://staff.fisika.ui.ac.id/tmart/kltot.jpg
15:00	**Near threshold $K^0 \Lambda$ photoproduction on the neutron studied with an electromagnetic calorimeter FOREST** *Presenter: Mr. TSUCHIKAWA, Yusuke (Tohoku University)* Baryon resonances have been experimentally studied by means of meson production reactions to understand low-energy scale quantum-chromo dynamics. Photoproduction is an useful tool to reveal properties of excited baryons. Indeed, the π and η photoproduction reactions have been intensively investigated until now. Kaon photoproduction is one of the best probes to study highly excited baryons, which couples to hidden strangeness. The $\gamma n \to K^0 \Lambda$ reaction is more advantageous than the K^+ photoproduction reactions which has been reported by many experimental groups. It is because the charged particle exchange is forbidden in the $K^0 \Lambda$ photoproduction since all of the participant particles are neutral. Moreover, the $\gamma n \to K^0 \Lambda$ photoproduction may have sensitivity to the prominent peak structure observed at $W=1.67$ GeV in the $\gamma n \to \eta n$ photoproduction cross section. A confirmation of the peak via another reaction should be helpful for revealing its mysterious nature so as to be rated one-star by the Particle Data Group in spite of the strong significance of the peak. The experiment was carried out at Research Center for ELectron PHoton Science (ELPH), Tohoku University. The incident photon energy ranges from the reaction threshold to 1.2 GeV. Photoproduction events were detected by an electromagnetic calorimeter complex FOREST. The $\gamma n \to K^0 \Lambda$ photoproduction was identified via $K_S^0 \to \pi^0 \pi^0 \to \gamma \gamma \gamma \gamma$ and $\Lambda \to p \pi^-$ decay chains. The particles in the final state were succesfully detected by the FOREST. Neutral kaons were clearly observed as a peak in the four photon invariant mass distribution. The differential and total cross sections for $K^0 \Lambda$ photoproduction were extracted. Comparisons of this result were performed with some theoretical works. We will present the current status of the $\gamma n \to K^0 \Lambda$ reaction.

15:20 **Strangeness photoproduction on quasifree neutrons**

Presenter: Dr. WERTHMUELLER, Dominik (University of Glasgow)

A reliable extraction of baryon resonance properties from meson photoproduction requires a complete isospin decomposition of the electromagnetic excitation amplitudes. This can only be achieved using experimental data from neutron targets as well as proton. This is of particular importance for N (I = 1/2) baryons which have different couplings to the proton and the neutron. In addition the production of certain states off the proton could be strongly suppressed compared to the neutron.

The database for photoproduction observables measured on quasifree neutrons is in general still sparse. The situation is even worse for reactions with strangeness in the final state. This is unsatisfactory as yet unknown nucleon resonances with masses above 1.7 GeV could have significant branching ratios to the kaon-hyperon (KY) final states. Indeed this has been shown as the recent PDG summary includes a better determination of resonances in this mass region largely through PWA of KY photoproduction. This is helped by the self-analyzing weak decay of certain hyperons which allows the determination of the recoil polarization without recoil polarimeter. Consequently, the larger number of available polarization observables could allow for a 'complete experiment' before nonstrange pseudoscalar meson photoproduction.

Experimental data acquired in the threshold region allows for a more straightforward interpretation due to reduced contributions in the theoretical description and are important for extrapolating to higher mass regions. The A2 experiment at MAMI, with its high intensity and excellent photon resolution, is ideally suited for this purpose and its calorimeters, Crystal Ball and TAPS, allow the detection of both neutral and charged kaons. Preliminary results of strangeness photoproduction on quasifree neutrons will be presented.

15:40 **Hunting the resonances in $p(\gamma,K^+)\Lambda$: (over)complete measurements and partial-wave analyses**

Presenters: Mr. NYS, Jannes (Ghent University), Prof. RYCKEBUSCH, Jan (Ghent University)

We have conducted a study of the extraction of reaction amplitudes from $p(\gamma,K^+)\Lambda$ data with the eye on determining the underlying nucleon resonance content. A complete set of measurements for pseudoscalar-meson photoproduction is a minimum set of observables from which one can determine the underlying reaction amplitudes unambiguously at a combination of the Mandelstam variables s and t. Complete sets of eight observables which hold great promise are the combination of the differential cross section, the three single-polarization and four double-polarization observables. In the transversity basis, the moduli from the reaction amplitudes can be extracted for those (s, t) combinations for which all single-polarization observables are available. Those conditions are met in a wide range of kinematics for the $p(\gamma,K^+)\Lambda$ reaction and it is shown that the energy and angular dependence of the moduli of the reaction amplitudes can be mapped in the resonance region [1, 2]. Mathematical completeness does not necessarily imply practical completeness when dealing with data with finite error bars. We explore the merits of introducing supplementary observables and consider so-called overcomplete sets. The concept of information entropy [3] is introduced to quantify the information yield as a function of the number of observables.

We compare the amplitude analysis from complete measurements with a conventional single-channel partial-wave analysis (PWA). Thereby, the amplitudes at fixed invariant energy $\sqrt{s}$ are decomposed in total spin and parity eigenstates. We have mapped the s and t dependence of the resonant and background contributions to the $p(\gamma,K^+)\Lambda$ reaction amplitude using the Regge-plus-resonance (RPR) model [4–6]. We find that all multipoles, including the low-order ones, are dominated by the background. Hence, extracting reliable resonance information hinges on the availability of background-substraction schemes –of which the RPR model is an example.

References

[1] T. Vrancx, J. Ryckebusch, T. Van Cuyck, and P. Vancraeyveld, Phys. Rev. C87, 055205 (2013), arXiv:1303.2936.

[2] J. Nys, T. Vrancx, and J. Ryckebusch, J. Phys. G42, 034016 (2015), arXiv:1502.01259.

[3] D. G. Ireland, Phys. Rev. C 82, 025204 (2010).

[4] T. Corthals, J. Ryckebusch, and T. Van Cauteren, Phys. Rev. C 73, 045207 (2006).

[5] L. De Cruz, J. Ryckebusch, T. Vrancx, and P. Vancraeyveld, Phys. Rev. C 86, 015212 (2012).

[6] L. De Cruz, T. Vrancx, P. Vancraeyveld, and J. Ryckebusch, Phys. Rev. Lett. 108, 182002 (2012).

Parallel-B: 26-1 / Chair : Tomoaki Hotta (14:30-16:00)

time	title
14:30	**Meson photoproduction experiments at ELPH, Tohoku University** *Presenter: Dr. ISHIKAWA, Takatsugu (Research Center for Electron Photon Science, Tohoku University)* Baryon spectroscopy is an important testing ground for understanding low energy QCD. Meson photoproduction experiments, which are complementary to π induced reactions for studying excited baryons, are conducted with an electromagnetic calorimeter FOREST at Research Center for Electron Photon Science (ELPH), Tohoku University. Among the vairous photoproduction reactions, the neutron target channels are of great interest. Recently, a narrow resonance has been observed in η photoproduction on the neutron. It was observed at Laboratory of Nuclear Science (the former name of ELPH), GRAAL, and CB-ELSA. The resonance would be attributed to a member of anti-decuplet pentaquark baryons with hidden strangeness since no signature corresponding to this bump has been observed so far in the proton channel. The baryon resonances including this bump are studied. The cross sections for π^0 and η photoproduction on the deuteron are presented, and the intermediate baryon resonances are discussed. The next generation FOREST experiments aims to study the baryons properties in nuclei. The planned experiment to search for η mesic nuclei to investigate $S_{11}(1535)$ properties in nuclei are also presented.
15:00	**Spectroscopy of pionic atoms in the (p,2He) reaction at RCNP** *Presenter: Dr. FUJIOKA, Hiroyuki (Kyoto University)* We propose a new method to produce deeply-bound pionic atoms by using the (p,²He) reaction. While the (d,³He) reaction is a well-established way for precision spectroscopy and a systematic study is ongoing at RIBF, a high resolution in the missing-mass spectroscopy for the (p,²He) reaction may be achieved by detecting two protons by the Grand Raiden spectrometer at RCNP. In this contribution, we will discuss the experimental concept and prospect.
15:20	**Chiral dynamics in the gamma p --> p pi0 reaction** *Presenter: Ms. HILLER BLIN, Astrid (University of Valencia)* We investigate the neutral pion photoproduction on the proton near threshold in covariant chiral perturbation theory with the explicit inclusion of Δ degrees of freedom. This channel is specially sensitive to chiral dynamics and the advent of very precise data from the Mainz microtron has shown the limits of the convergence of the chiral series for both the heavy baryon and the covariant approaches. We show that the inclusion of the Δ resonance substantially improves the convergence leading to a good agreement with data for a wider range of energies. e-Print: arXiv:1412.4083 [hep-ph]

15:40 **The performance study of an electro-magnetic calorimeter for the LEPS2/BGOegg experiment**

Presenter: Mr. MATSUMURA, Yuji (Tohoku University)

It is considered that hadron mass is generated by spontaneous breaking of chiral symmetry in QCD. Especially, an $\eta^\prime$ meson has larger mass than the other pseudo scalar mesons affected by $U_A(1)$ anomaly effect. $\eta^\prime$ mass is expected to decrease significantly in nuclear matter due to anomaly effect, and it will result in strong attractive and small absorption potential between an $\eta^\prime$ and a nucleus. As a result, an $\eta^\prime$ mesic nucleus, a bound state of an $\eta^\prime$ and a nucleus, is expected to be formed. If we can observe $\eta^\prime$ mesic nuclei, we will obtain significant information on in-medium effect on chiral symmetry and $U_A(1)$ anomaly.

We study hadron properties in nuclear matter via meson photoproduction off nuclei at SPring-8/LEPS2 beamline. The search for an $\eta^\prime$ mesic nucleus is one of the main purposes of the experiment. We use a photon beam with energies from 1.4 to 2.4 GeV and a nuclear target. An $\eta^\prime$ mesic nucleus is searched in the missing mass spectrum of forward going protons detected by TOF-RPCs. To reduce experimental background, η meson generated in $\eta^\prime N\to \eta N$ conversion processes are tagged, which is identified by detecting 2 γs with an electro-magnetic calorimeter BGOegg.

The BGOegg calorimeter consists of 1320 BGO crystals, and covers a polar angle from 24 to 144 degrees around the target. The energy and position resolutions of the BGOegg are previously measured to be 1.3 % and 3.1 mm at 1 GeV, respectively. We started to take data with carbon and polyethylene targets from April 2014, and we studied the performance of the BGOegg calorimeter with the collected data.

In this talk, we will present the result of the performance study of the BGOegg calorimeter.

Parallel-C: 26-1 / Chair : Shin Nan Yang (14:30-16:00)

time	title
14:30	**Compositeness of hadrons and near-threshold dynamics** *Presenter: Prof. HYODO, Tetsuo (Yukawa Institute for Theoretical Physics)* We present the recent developments in the studies of the structure of hadron resonances, focusing on the notion of the compositeness in terms of the hadronic degrees of freedom. We discuss the model dependence of the compositeness, and show that the structure of the near-threshold bound states and resonances is model-independently determined, thanks to the low-energy universality.
15:00	**Compositeness of the $\Delta (1232)$ resonance in πN scatterings** *Presenter: Dr. SEKIHARA, Takayasu (Theory group, RCNP)* Exotic hadrons are hadrons which have different configurations from ordinary three quarks ($q q q$) for baryons or quark-antiquark pair ($q \bar{q}$) for mesons, and to discover exotic hadrons and reveal their internal structure is one of the most important topics in hadron physics. Recently, "compositeness" has been discussed intensively so as to distinguish the hadronic molecules from hadrons in other compact configurations such as $q q q$. The compositeness is defined as contributions from two-body wave functions to the normalization of the total wave function and hence measures amount of the two-body composite states in which character of each constituents is not lost. Therefore, by using the compositeness one can deduce whether a certain hadron is hadronic molecule or not. In this Talk we introduce the physical meaning of the compositeness and apply it to $N^{\ast}$ resonances such as $\Delta (1232)$ in a chiral effective model in order to discuss their internal structure in terms of πN and other meson-baryon components.
15:20	**Mixing of pseudoscalar-baryon and vector-baryon in the J^P=1/2^− sector and the N*(1535) and N*(1650) resonances** *Presenter: Dr. GARZON, E.J. (IFIC University of Valencia)* We study the meson-baryon interaction with J^P=1/2^– using the hidden-gauge Lagrangians and mixing pseudoscalar meson-baryon with the vector meson-baryon states in a coupled channels scheme with πN,ηN,KΛ,KΣ,ρN, and πΔ (d wave). We fit the subtraction constants of each channel to the S11 partial wave amplitude of the πN scattering data extracted from the partial wave analysis of the George Washington group. We find two poles that we associate to the N*(1535) and the N*(1650) resonances, with negative subtraction constants of natural size, and compare the results with empirical determinations of these pole positions. We calculate the branching ratios for the different channels of each resonance and we find a good agreement with the experimental data. The cross section for the π−p→ηn scattering is also evaluated and compared with experiment.
15:40	**Structure of Lambda(1405) and construction of antikaon-nucleon potential based on chiral unitary approach** *Presenter: MIYAHARA, Kenta (Kyoto University)* The single-channel local potential for the antikaon-nucleon system is constructed, focusing on the behavior of the scattering amplitude in the complex energy plane and considering the constraint from new experimental data, SIDDHARTA data. In previous works, the local potential has been constructed to reproduce the scattering amplitude derived from the coupled-channel chiral unitary approach on the real energy axis. However, analyzing the scattering amplitude in the complex energy plane, we find that the scattering amplitude is not completely reproduced away from the real axis. It is considered that the difference of the pole structure affects the physical observables in few-body systems. Therefore, we establish the method to improve the local potential for a better description of the scattering amplitude in the complex energy plane. Using this method and considering SIDDHARTA data, we construct a new local potential which is useful for quantitative calculation of antikaon-nuclear. Furthermore, using this new potential, we analyze the structure of Lambda(1405) and get the result indicating the meson-baryon molecular state of Lambda(1405).

Parallel-A: 26-2 / Chair : Hiroyuki Kamano (16:30-17:50)

time	title
16:30	**Bonn-Gatchina partial wave analysis of two meson photoproduction reactions** *Presenter: Dr. NIKONOV, Victor (PNPI)* The partial wave analysis of Crystal Barrel, MAMI and CLAS data on double meson photoproduction reactions is presented. Part of the data was taken with a diamond radiator producing linearly polarized photons, and beam asymmetries were derived. Properties of nucleon and Delta resonances contributing to the data were determined within the BnGa partial wave analysis. The data presented allow us to determine branching ratios of nucleon and Delta resonances for their decays via several intermediate states. These properties allow us to make the classification of the observed states.
16:50	**Double Polarization Observable E in η, π^{0} and 2π^{0} Photoproduction off Protons and Neutrons** *Presenter: Mr. DIETERLE, Manuel (Department of Physics, University of Basel, Switzerland)* The identification of the relevant effective degrees of freedom of QCD is a very important step in order to understand the structure of the nucleon. Whereas for the reactions on the proton a lot of experimental data is available, data for the reactions on the neutron is sparse. In addition, even though in recent years much progress in the theoretical description of the results was achieved, the available models are still very controversial even at low energies where only few resonances contribute. Meson photoproduction offers unique possibilities to provide new input for this situation. Among the different channels, π^{0} and $2\pi^{0}$ photoproduction are in particular important as non-resonant background terms as pion-poles or Kroll-Rudermann are strongly suppressed because photons couple only weakly to neutral pions. Double meson photoproduction has the great advantage of enabling access to higher lying nucleon resonances that have no significant decay mode to the nucleon ground state via photoproduction of single mesons. The investigation of photoproduction of η mesons is very interesting as the resulting cross section on the neutron shows a large resonance-like structure, beyond the dominating $S_{11}(1535)$, which is not seen on the proton. This work presents preliminary results from experiments at the German electron accelerators ELSA in Bonn and MAMI in Mainz. Helicity dependent cross sections $\sigma_{1/2}$ and $\sigma_{3/2}$ as well as the double polarization observable E of photoproduction of η, π^{0} and $\pi^{0}\pi^{0}$ mesons off quasi-free protons and neutrons in the second and third nucleon resonance region have been measured.
17:10	**Measurement of polarization observables in neutral double pion photoproduction off the proton with the CBELSA/TAPS experiment** *Presenter: Mr. MAHLBERG, Philipp (University of Bonn)* Measurement of polarization observables in neutral double pion photoproduction off the proton with the CBELSA/TAPS experiment In contrast to the atomic spectrum with its sharp and well defined excitation levels, the nucleon excitation spectrum is dominated by broad, overlapping resonances. Partial wave analyses are needed to extract the contributing resonances from the experimental data. In order to find an unambiguous solution, the measurement of polarization observables is indispensable. The Crystal Barrel/TAPS experiment at the electron accelerator ELSA is, due to its high photon detection efficiency and its almost complete solid angle coverage, ideally suited to measure neutral mesons decaying into photons. In combination with an either linearly or circularly polarized photon beam and a longitudinally or transversely polarized target different single and double polarization observables become accessible. At higher energies, the cross sections show that multi-meson decay channels gain in importance compared e.g. to single pseudoscalar meson photoproduction. In this region, also cascading decay processes via intermediate resonances are observed. In this talk, preliminary results for different polarization observables in neutral double pion photoproduction measured with the CBELSA/TAPS experiment will be presented. Supported by the Deutsche Forschungsgemeinschaft (SFB/TR 16).

17:30	**Photoproduction of the scalar mesons f0(980) and f0(500) off the nucleon** *Presenter: LEE, Jehee (Inha university)* We investigate the photoproduction of the $γN→f_0(980)N$ and the $γN→f_0(500)N$ within a framework of the effective Lagrangian approach. The $γN→f_0(980)N$ and the $γN→f_0(500)N$ processes include the ρ meson Regge trajectory in the t-channel and the nucleon Regge trajectory in the u-channel. Furthermore, $f_0(980)N$ photoproduction involves the nucleon exchange in the s-channel while $f_0(500)N$ photoproduction contains the nucleon resonances in the s-channel. We discuss the numerical results for the total cross sections and the differential cross sections and possible extension of the present work.

Parallel-B: 26-2 / Chair : Derek Leinweber (16:30-18:00)

time	title
16:30	**Nucleon excited states from lattice QCD with overlp fermions** *Presenter: Prof. CHEN, Ying (Insttitute of High Energy Physics, Chinese Academy of Sciences, China)* We investigate the spectrum of nucleon excited states from both quenched and unquenched lattice QCD with overlap fermions. For the first 1/2+ excited state, its mass is close to the Roper mass and it Bethe-Salpeter wave function has a clear radial node. We also study the scattering states and the questions relevant to the S11 state in the 1/2- channel.
17:00	**Strange and nonstrange baryon spectra in the interacting quark-diquark model** *Presenters: Prof. SANTOPINTO, Elena (INFN and Genoa University), Dr. FERRETTI, Jacopo (Università La Sapienza, Rome)* We discuss the results of a quark-diquark model calculation of the strange [1] and nonstrange [2] baryon spectra in the interacting quark-diquark model [3]. This is a potential model, where baryons are described as bound states of a constituent quark and diquark; the diquark is thus treated as an effective constituent particle and describes two strongly correlated quarks in S-wave. The relative motion between the quark and the diquark is written as a function of the relative coordinate r between the quark and the diquark, instead of two relative coordinates as in 3 quarks quark models. Because of this, we obtain a spectrum which is less rich than that of a typical 3 quarks quark model. Finally, our results are compared to the existing experimental data and the problem of missing resonances is also discussed. References [1] E. Santopinto and J. Ferretti, arXiv: 1412.7571. [2] J. Ferretti, A. Vassallo and E. Santopinto, Phys. Rev. C 83, 065204 (2011); M. De Sanctis et al., arXiv: 1410.0590. [3] E. Santopinto, Phys. Rev. C 72, 022201 (2005).
17:20	**Unquenched Quark Model** *Presenter: Mr. GARCIA-TECOCOATZI, Hugo (ICN-UNAM AND INFN GENOVA)* We briefly analyze the formalism of the unquenched quark model (UQM) and its application to the calculation of hadron spectra with self-energy corrections, due to the coupling to the meson-meson(or baryon-meson) continuum. In the UQM, the effects of q-anti q sea pairs are introduced explicitly into the quark model through a QCD-inspired 3 P0 pair-creation mechanism. The main applications of UQM to spectroscopy and other observables are analyzed.
17:40	**The nucleon resonance around 2 GeV** *Presenter: Dr. HE, Jun (Institute of Modern Physics, Chinese Academy of Sciences)* The study of nucleon resonance is an important topic in hadron physics. The most important way to study the nucleon resonances is the collision of the photon and nucleon. The knowledge about the nucleon resonances around 2 GeV is still scarce. Recently the CLAS Collaboration released their new high-precision data about the cross section of the $\Sigma(1385)$ and $\Lambda(1520)$ photoproduction. Due to the high threshold, the new data is very helpful to study of the nucleon resonances around 2 GeV. The new CLAS data is fitted in an effective Lagrangian method combined with the constituent quark mode. In $\Sigma(1835)$ photoproduction, the contribution from $\Delta(2000)$is much important than the contributions from other nucleon resonances, and the N(2120) is dominant in the $\Lambda(1520)$ photoproduction. The data support that the $\Delta(2000)$and N(2120) are the third Δ state with spin-parity 5/2+ and the third nucleon state with spin-parity 3/2- in constituent quark model, respectively. Other nucleon resonances are found to give negligible contributions in the channel considered in this work. With such assignment of N(2120), there is no position to put N(1875) in quark models. With a calculation about its mass and decay width in a Bethe-Salpeter approach, it is plausible to interprete the N(1875) as a bound state of Sigma(1385) and kaon.

Wednesday 27 May 2015

Plenary: 27-1 / Chair : Elena Santopinto (09:30-11:00)

time	title
09:30	**Exposing running masses via studies of nucleon resonances** *Presenter: ROBERTS, Craig (Argonne National Laboratory)* The running of dressed-quark and gluon masses is a fundamental feature of strong-coupling QCD. It has a measurable impact on hadron properties. That impact is expressed with particular keenness in the properties of nucleon resonances. This will be elucidated through a unifying analysis of the nucleon and the Delta and Roper resonances.
10:00	**Nucleon Form Factors and Polarizabilities at Low Q** *Presenter: Dr. PASCALUTSA, Vladimir (University of Mainz)* The good old subject of low-energy nucleon structure has recently been shaken and stirred by the "proton radius puzzle", which is the many sigma discrepancy in the value of the proton charge radius obtained from muonic-hydrogen versus hydrogen spectroscopy. I am going to review this puzzle, as well as two smaller puzzles concerning the proton polarizabilities, and will discuss the possible theoretical and experimental advances needed to resolve them.
10:30	**Neutrinoproduction of Pions** *Presenter: Prof. MCFARLAND, Kevin (University of Rochester)* For current and future neutrino oscillation experiments, the neutrinoproduction of pions has a significant impact on the reconstruction of the neutrino flavor and energy. In neutrino experiments, models for neutrino interactions must span a wide range of energies and all possible final states because the interactions in a far detector of an oscillation experiment are so rare. I discuss the recent measurements of neutrinoproduction of pions, the current models used to predict this pion production, and recent comparisons between the two.

Plenary: 27-2 / Chair : Craig Roberts (11:30-13:00)

time	title
11:30	**Resonance production and decay in proton and pion induced collisions with HADES** *Presenter: Dr. PRZYGODA, Witold (Jagiellonian University)* HADES is a versatile magnetic spectrometer installed at GSI Darmstadt on SIS18. High acceptance, powerful particle (p/K/π/e) identification and very good mass resolution allows to study both hadron and rare dilepton decays of baryon resonances with masses up to 2 GeV/c^2 in proton and pion induced reactions. The resonance contributions were determined in proton proton collisions from exclusive one-pion and two-pion channels, in the framework of OPE model and partial wave analysis. The obtained solutions provide the evolution of resonance production with the beam energy. The study of the ppe^+e^- exclusive channel gave the insight on the Dalitz decays of the baryon resonances and, in particular, on the electromagnetic transition form-factors in the time-like region. Recently, HADES measured also one-pion, two-pion and e^+e^- production in π^--N reactions. First results will be presented.
12:00	**Hadron spectroscopy and interactions from lattice QCD** *Presenter: Dr. EDWARDS, Robert (Jefferson Lab)* There has been recent, significant, advances in the determination of the hadron spectrum. Current efforts have focused on the development and application of finite-volume formalisms that allow for the determination of scattering amplitudes as well as resonance behavior in coupled channel systems. I will review some of these recent developments and outline future directions of research.
12:30	**Hadron interactions from phase shift analysis in lattice QCD** *Presenter: Dr. ISHIZUKA, Naruhito (University of Tsukuba)* Recent progress of simulation algorithms, supported by the development of computer power, has made it possible to study hadron interaction from the scattering phase shift by the lattice QCD. In this talk I would like to give review of resent progress of this field of the lattice QCD.

Parallel-A: 27-1 / Chair : Kiyoshi Tanida (14:30-15:40)

time	title
14:30	**Neutrino-induced meson productions** *Presenter: Dr. NAKAMURA, Satoshi (Osaka University)* We discuss our dynamical coupled-channels (DCC) model for neutrino-nucleon interaction in the resonance region where single- and double-pion productions are dominant. Our DCC model is based on meson-exchange non-resonant mechanisms, and excitaions of nucleon resonances. By solving a set of coupled-channels scattering equation, we obtain amplitudes for meson productions such as pi N, pi pi N, eta N, K Sigma and K Lambda. The DCC model has been well tested by a large amount of data for meson productions induced by pion, photon and electron. We extend the DCC model to describe the neutrino-induced processes. Developing the axial-current is a crucial part of the extension. We present and discuss results of our calculations for the neutrino-induced meson production cross sections. We also compare our results with available experimental data.
15:00	**Incoherent Pion Production in Neutrino-Deuteron Reactions** *Presenter: Dr. SATO, toru (Osaka University)* Incoherent Pion Production in Neutrino-Deuteron Reactions[1] Jia-Jun Wu, T. Sato, T.-S. H. Lee A precise knowledge of neutrino-nucleus reactions is crucial in determining the properties of neutrinos. In the region of a few GeV neutrino energy, the Δ(1232) resonance plays an important role as well as the quasi-elastic knock out of nucleons. The starting point of analyzing the neutrino-nucleus reactions in this energy region is a theoretical model which can describe the cross sections of the neutrino-induced single pion production on proton (p) and neutron (n). These cross sections had been obtained from the experiments on hydrogen and deuterium targets at ANL, BNL and BEBC extracted from the analysis of the data from the measurements on both the hydrogen and the deuterium targets. The essential assumption of these analyses is that in the region near the peak of the quasi-free nucleon knock out process, one of the nucleons in the deuteron does not participate in the reaction mechanism. In this work we examine the extent to which this spectator approximation procedure is valid. The calculations include an impulse term and one-loop contributions from nucleon-nucleon (NN) and pion-nucleon (πN) final state interactions. The input amplitudes of πN scattering and electroweak pion production reaction on the nucleon are generated from a dynamical model which describes very extensive data of πN scattering and both the electromagnetic and the weak pion production reactions on the nucleon. Our results strongly suggest that the spectator approximation used in the previous analyses to extract the pion production cross sections on the nucleon from the data on the deuteron is not valid for the $\nu + d \rightarrow \mu^-+ \pi^+ +n+p$, but is a good approximation for $\nu + d \rightarrow \mu^-+ \pi^0 + p+p$. [1] Jia-Jun Wu, T. Sato and T. -S. H. Lee, Phys. Rev. C 91, 035203 (2015).
15:20	**High statistic analysis of nucleon form factor in lattice QCD** *Presenter: Dr. SHINTANI, Eigo (Mainz University)* I would like to present our recent analysis of nucleon form factor (axial, scalar and tensor charge and isovector form factors) with high statistics in lattice QCD. Using the efficient all-mode-averaging technique we develop recently, it enables us to obtain precise lattice result of form factors in various lattice spacings, lattice volumes in 3--4 fm and quark masses in 0.2--0.5 GeV. Numerical study of excited state contamination performed in two-flavor Wilson-clover fermion configurations suggests that there appears large effect in source-sink separation less than 1.3 fm, and in order to control it below a few percent error we need to separate more than 1.5 fm. I present several analysis including the first excited state contamination and show the consistency test with ground state dominant region. I also discuss the chiral behaviour and systematics uncertainties of finite size and lattice artifact effect.

Parallel-B: 27-1 / Chair : Noriyoshi Ishii (14:30-15:50)

time	title
14:30	**Coupled channel hadronic interactions from Lattice QCD** *Presenter: SASAKI, Kenji (University of Tsukuba)* Hadronic interactions are the key to study a bound and/or resonance state in multi-hadron system. In recent studies, it has become possible to derive them directly from the fundamental theory, QCD. We report on how to derive baryon-baryon interactions from lattice QCD simulation and their extension to the coupled channel cases. Furthermore we also discuss the possibility of Dibaryon using these potentials.
15:00	**Extraction of hadron resonances from finite volume** *Presenter: Prof. DORING, Michael (The Goerge Washington University)* With quark masses coming closer to the physical limit, hadron resonances on the lattice can decay. Scattering phase shifts become available through the L\"uscher framework. Extensions to coupled channels, asymmetric boxes and multi-particle systems will be discussed. In particular, new lattice data are shown to accommodate the two-pole hypothesis for the Lambda(1405).
15:30	**Finite-volume Hamiltonian method for ππ scattering in lattice QCD** *Presenter: Dr. WU, Jiajun (The University of Adelaide)* Within a formulation of ππ scattering, we investigate the use of the finite-volume Hamiltonian approach to resolve scattering observables from lattice QCD spectra in center mass of system, boosted system (total momentum is nonzero) and multi-channel case. Here we study the use of the Hamiltonian framework as a parametrization that can be fit directly to lattice spectra. By this method, The properties of hadron, such as mass, width and coupling, can be directly extracted from the lattice spectra. Furthermore, the comparisons with well-known Luscher formalism are also investigated. It shows that two methods are equivalent at large lattice size but different at small lattice size. The comparison therefore provides an estimate of the limitations associated with of scattering parameters.

Parallel-C: 27-1 / Chair : Hyun-Chul Kim (14:30-15:50)

time	title
14:30	**Modification of nucleon spectral function in the nuclear matter from QCD sum rule** *Presenter: Mr. OHTANI, Keisuke (Tokyo Institute of Technology)* The QCD sum rule method is a powerful tool for studying hadron properties directly from QCD. Recently, the Maximum Entropy Method (MEM) has been applied and is successful in the analysis of the rho meson sum rule [1] and the nucleon sum rule [2] in vacuum. We have applied the MEM analysis of QCD sum rules to the spectral function of the nucleon and its negative parity excited states in vacuum and have constructed the parity projected nucleon sum rules including the first order \alpha_s corrections [3]. Both the positive and negative parity spectral functions of the nucleons are extracted. We find that the difference between the positive and negative parity spectral functions is mainly caused by the chiral condensate. Applying this method to the analyses in nuclear matter, we investigate the relation between the masses and partial restoration of chiral symmetry breaking. Furthermore, we estimate the values of scalar and vector self-energies of these states. [1] P. Gubler and M. Oka, Prog. Theor. Phys. 124, 995 (2010). [2] K. Ohtani, P. Gubler and M. Oka, Eur. Phys. J. A 47, 114 (2011). [3] K. Ohtani, P. Gubler and M. Oka, Phys. Rev. D 87, 034027 (2013).
14:50	**Effects of the scalar mesons in a skyrme model with hidden local symmetry** *Presenter: Mr. HE, BingRan (Nagoya University)* We study the effects of light scalar mesons on the skyrmion properties by first constructing a mesonic model including pion, rho, omega, two-quark and four-quark scalar mesons. In our model, the physical scalar mesons are defined as mixing states of the two- and four-quark states. We find that the scalar mesons reduce the skyrmion mass as expected and the lighter scalar meson is, the lighter soliton mass becomes when scalar meson decouples from the vector mesons. When the interaction between scalar meson and vector mesons are considered, we find that when the vector meson becomes lighter, the soliton bcomes heavier since repulsive force arising from the ω meson becomes stronger. For the effect of the light scalar meson on the skyrmion properties, we find that the lager two-quark component of the lighter scalar meson is, the lighter soliton mass becomes. In addition to the soliton mass, we also study the scalar meson effect on the soliton radii and we find that the effect depends on how the scalar meson is incorporated in the model.
15:10	**Parity doublet model with the U$(3)_L \times U(3)_R$ chiral symmetry** *Presenter: Mr. NISHIHARA, Hiroki (Nagoya Univ.)* We study properties of baryons by using the parity doublet model with the U$(3)_L \times U(3)_R$ chiral symmetry. The model is constructed from 6 octet- and 2 decuplet-baryons which are introduced as representations of the chiral symmetry. By fitting the experimental values and determining the values of all parameters, we will give the predictions for the masses and the decay widths of hyperons.
15:30	**Fock States in AdS / QCD models to describe Nucleons** *Presenter: Dr. VEGA, Alfredo (Universidad de Valparaiso)* We consider a model based on Gauge / Gravity ideas that consider several Fock states to describe hadrons. We present an analysis of nucleon electromagnetic form factors and we describe the electroproduction of the N(1440) Roper resonance with the holographic model discussed.

Parallel-A: 27-2 / Chair : Toru Sato (16:30-18:00)

time	title
16:30	**Physics with HypTPC at J-PARC** *Presenter: Dr. HOSOMI, Kenji (Japan Atomic Energy Agency)* Understanding of low-energy QCD is one of the main topics in hadron physics, but in general it is not straightforward due to non-perturbative nature. Nucleon resonances are a essential object for investigating QCD because the resonance spectrum holds fundamental information about non-perturbative QCD. Most of known nucleon resonances were determined primary from partial-wave analysis (PWA) on the $\pi N \to \pi N$ data. Recently, high-precision photoproduction data on the $\pi \pi N$ final state have been provided by electron/photon beam facilities. On the other hand, hadronic data on the $\pi N \to \pi \pi N$ and $\pi N \to K Y$ channels, which were taken about three decades ago, are insufficient for PWA at present. Since high-mass resonances decay into $\pi \pi N$ final state with large branching ratios and some resonances are expected to couple strongly to strange-particle final state, high-precision data of these reactions are particularly required for further studies of nucleon resonances. With J-PARC, it is now possible to perform precise measurements of these reactions. The J-PARC E45 collaboration proposed to measure the $\pi N \to \pi \pi N$ and $\pi N \to K Y$ reactions employing a Hyperon Time Projection Chamber (HypTPC) [1]. In this talk, we will discuss physics interests in the E45 experiment. R&D status of detectors, especially for HypTPC, will also be reported. In addition, a H-Dibaryon search experiment [2] at J-PARC (J-PARC E42), which shares the same experimental apparatus with E45, will be mentioned. [1] K. Hicks and H. Sako $et~al.$, J-PARC Proposal No. E45, 2012. [2] J. K. Ahn and K. Imai $et~al.$, J-PARC Proposal No. E42, 2011.
17:00	**Combined analysis of πN->πN and πN->ππN in ChPT** *Presenter: Mr. SIEMENS, Dmitrij (Ruhr-Universität Bochum)* In my talk, I will focus on the reactions πN->πN and πN->ππN, which are studied at one-loop level in the frameworks of covariant and heavy baryon chiral perturbation theory. Performing combined fits to determine the relevant low-energy constants, predictions are made for various observables. In addition, first attempts to include Δ(1232) as an explicit degrees of freedom will be discussed. (PhysRevC.89.065211)
17:20	**Baryonic spectroscopies at BESIII** *Presenter: Ms. LIU, Fang (Institute of High Energy, CAS, Beijing, China)* Based on 106 million $\psi(3686)$ events with BESIII detector at BEPCII, some excited nucleon results from the partial wave analysis are presented. In the decay of $\psi(3686)$ into $p \bar{p} \pi^{0}$, two new baryonic excited states, $J^{PC}=\frac{1}{2}^{+} N(2300)$ and $J^{PC}=\frac{5}{2}^{-} N(2570)$ are significant, and additional five N^{*} excited states are observed. In $\psi(3686)$ decay into $p \bar{p} \eta$, an excited nucleon state $N(1535)$ is dominant. And in $\psi(3686) \rightarrow \Lambda \bar{\Sigma^{+}} \pi^{-}+c.c.$, some excited strange baryons $\Lambda^{\star}$ and $\Sigma^{\star}$ are measured on $\Sigma^{+} \pi^{-}$ and $\Lambda \pi^{-}$ mass spectra.
17:40	**Pentaquark Θ^+ search at HERMES** *Presenter: Mr. WANG, Siguang (School of Physics, Peking University)* The earlier search at HERMES for narrow baryon states excited in quasi-real photoproduction, decaying through the channel $pK_{S}^{0}\rightarrow p\pi^+\pi^-$, has been extended with improved decay-particle reconstruction, more advanced particle identification, and increased event samples. The structure observed earlier at an invariant mass of 1528 MeV shifts to 1522 MeV and the statistical significance drops to about 2σ for data taken with a deuterium target. The number of events above background is $68_{-31}^{+98}\text{(stat)}\pm13\text{(sys)}$. No such structure is observed in the hydrogen data set.

Parallel-B: 27-2 / Chair : Ying Chen (16:30-18:00)

time	title
16:30	**On the structure of Zc(3900) from lattice QCD** *Presenter: Dr. IKEDA, Yoichi (RIKEN)* We study the candidate of charmed tetraquark Zc(3900) from full QCD simulation. We measure wave functions (NBS wave functions) on the lattice, and extract interaction kernels. Using the interactions obtained from lattice, we calculate the pole of the scattering amplitudes on the complex energy plane, and production reaction of the Zc(3900) from Y(4260) decay. I will explain how to extract interaction in LQCD and report the results of pole position and invariant mass spectrum for Zc(3900).
17:00	**Transitions of charm/bottom baryons with pion emissions** *Presenter: YASUI, Shigehiro (Tokyo Institute of Technology)* We discuss transition decay widths by one-pion emissions for excited charm/bottom baryons by following the heavy-quark symmetry and its breaking effects at ${\cal O}(1/M)$ for a heavy-baryon mass M. Constructing the heavy-baryon effective theory, we introduce the interaction Lagrangians for the heavy baryons and a pion. We show that the transition decay widths in different spin channels are related model-independently up to ${\cal O}(1/M)$. We also discuss the application to experimental studies of excited heavy baryons.
17:20	**Baryon states with hidden charm in the extended local hidden gauge approach** *Presenter: Dr. UCHINO, Toshitaka (IFIC)* The s-wave interaction of $\bar{D}\Lambda_c,~\bar{D}\Sigma_c,~\bar{D}^\ast\Lambda_c,~\bar{D}^\ast\Sigma_c$ and $\bar{D}\Sigma_c^\ast, \bar{D}^\ast\Sigma_c$, are studied within a unitary coupled channels scheme with the extended local hidden gauge approach. In addition to the Weinberg-Tomozawa term, several additional diagrams via the pion-exchange are also taken into account as box potentials. Furthermore, in order to implement the full coupled channels calculation, some of the box potentials which mix the vector-baryon and pseudoscalar-baryon sectors are extended to construct the effective transition potentials. As a result, we have observed six possible states in several angular momenta. Four of them correspond to two pairs of admixture states, two of $\bar{D}\Sigma_c – \bar{D}^\ast\Sigma_c$ with $J = 1/2$, and two of $\bar{D}\Sigma_c^\ast–\bar{D}^\ast\Sigma_c$ with $J = 3/2$. Moreover, we $\bar{D}\Sigma_c$ resonance which couples to the $\bar{D}\Lambda_c$ channel and one spin degenerated bound state of $\bar{D}^\ast\Sigma_c^\ast$ with $J = 1/2, 5/2$.
17:40	**Photon and pion induced reactions for the study of nucleon resonances** *Presenter: Mr. KIM, Sangho (RCNP, Osaka University)* We present photon- and pion- induced K* production. Emphasis on the nucleon resonances is made for the former case. Nucleon resonances are important for explaining this process. For the latter case, the t-channel process, K* Reggeon contribution, played a crucial role in explaining its experimental data. Nucleon resonances give almost negligible contributions.

Thursday 28 May 2015

Plenary: 28-1 / Chair : David Ireland (09:30-11:00)

time	title
09:30	**Baryon spectroscopy at B-factories** *Presenter: Dr. NIIYAMA, Masayuki (Kyoto)* In order to understand the hadron spectroscopy and low energy QCD dynamics, it is highly important to study the correlation between quarks. Recent discoveries of tetraquark mesons, $Z_c(4430)^+$, $Z_b(10610)^+$, $Z_b(10650)^+$, made us realized that colored diquark correlations and quark-antiquark correlations play important roles to describe their internal structure. The diquark correlation has also been discussed for the baryon spectroscopy. It has been suggested that strong diquark correlations may appear in heavy baryon spectra. Thus, charmed baryons are interesting objects for the study of diquark correlation. On the other hand, several meson-baryon molecule candidates has been proposed theoretically to understand $\Lambda(1405)$ and $\Xi(1690)$. These molecular states are important to understand quark-antiquark correlations. At B-factories, Belle and BaBar, various baryon productions in $e^+ e^-$ collisions near the $\Upsilon(4S)$ energy has been studied. Thanks to high luminosity, high resolution and excellent particle identification power, hyperons and charmed baryons have been observed in very good signal-to-noise ratio, and their spectroscopy and quantum numbers have been studied intensively. In this talk, a review of recent studies on baryon properties at B-factories is presented.
10:00	**Penta-quark states with strangeness, hidden charm and beauty** *Presenter: Prof. ZOU, Bing-Song (ITP/CAS)* There are strong evidences for several new hyperon resonances which fit in the picture of penta-quark states. Based on this picture, some new hyperon excited states and super-heavy N* and Lambda* with hidden charm or beauty are predicted to exist and can be searched for by forth-coming experiments.
10:30	**The nature of near--threshold XYZ states** *Presenter: Dr. WANG, Qian (Institut f□ur Kernphysik and Institute for Advanced Simulation, Forschungszentrum J□ulich, D{52425 J□ulich, Germany)* In recent years various narrow peaks were observed in both charmonium and bottomonium mass regions which cannot be described by the so far very successful quark model. In order to understand their nature there have been various different theoretical interpretations proposed in the literature. We show in this presentation that based on the properties that some of these states are located near the S-wave open-channel thresholds, they should be genuine states, i.e. corresponding to poles of S--matrix. Such a scenario is a consequence of the self-consistent treatment for the near-threshold non-perturbative interactions and can be explained by a near-by pole generated dynamically in the S--matrix. This can possibly provide a better understanding of some of those threshold states, such as $X(3872)$, $Z_c(3900)$, $Z_c(4020)$, $Z_b(10610)$ and $Z_b(10650)$, which are located close to the $D\bar D^*$, $D\bar D^*$, $D^*\bar D^*$, $B\bar B^*$ and $B^*\bar B^*$ thresholds in a relative S--wave, respectively.

Plenary: 28-2 / Chair : Hiroyuki Noumi (11:30-12:50)

time	title
11:30	**Excited Hyperons at Jefferson Lab** *Presenter: Dr. GUO, Lei (Florida International University)* Compared with the excited nucleon resonance sector, the spectrum of the excited hyperons have not been thoroughly investigated. Future experiments at CLAS12 and GlueX have great potential of discovering previously unknown cascade resonances, and providing essential information about the photoproduction mechanism of S=-3 Omega baryons, particularly interesting since none of the constituent quark is from the target. The production of S=-1 hyperons are also intimately related to the intermediate nucleon resonances, as have been demonstrated in various studies of photoproduction of ground state hyperons. The analysis of various channels involving the cross section, beam helicity asymmetries, PWA results, and the polarization measurements from CLAS involving hyperons will be presented. The projected results from future CLAS12/GlueX experiments will also be discussed.
12:00	**Overview of hadron physics at J-PARC** *Presenter: Dr. TANIDA, Kiyoshi (Advanced Science Research Center, Japan Atomic Energy Agency)* I will overview experiments related to hadron physics at J-PARC. Especially interesting results were obtained in E27 experiment where a peak position in the d(pi+,K+) missing mass spectrum suggests a significant mass shift of Sigma(1385) and/or Lambda(1405). Results for penta-quark search in p(pi-,K+) reaction (E19) will be also reported. I will also introduce future experiments related to N* and Y* spectroscopy.
12:30	**Closing**