Ilaria Balossino | Curriculum Vitae

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Research Activities

Post Doctoral position with INFN Ferrara **February, 21 2018 - now, Ferrara**
INFN Ferrara
Quality assurance, installation and commissioning of the cylindrical GEM detector of the BESIII experiment

PhD in PHYSICS **November, 3 2014 - February, 28 2018, Ferrara**
Università degli Studi di Ferrara
Studies of innovative photon detectors working in the single-photon regime for the RICH detector of the CLAS12 experiment

Experimental activity for the HPS experiment **May - July 2014**
INFN Genova
Characterization and assembling of the Light Monitoring System (LMS) for HPS experiment

Academic Activities

Master Degree in PHYSICS **April, 15 2014, Torino**
Università degli Studi di Torino
Study of radiation effects on prototypes of the $\bar{\text{P}}$ANDA Micro Vertex Detector **108/110**

Bachelor Degree in PHYSICS **October, 11 2011, Torino**
Università degli Studi di Torino
Analysis and discrimination of breast density through digital tomosynthesis **96/110**

Grants

Bando Lunga Mobilità 2016 **February 2016**
Università degli Studi di Ferrara
Grant to spend at least one month abroad for activities correlated to the PhD project:
I spent about six weeks at Jefferson Laboratory, Newport News, VA (USA) during the summer to work on the spherical mirror for the RICH detector.

Bando Giovani Ricercatori, Fondi 5X1000 **September 2016**
Università degli Studi di Ferrara
Grant to spend at least three month abroad for activities correlated to the PhD project:
I spent about four month at Jefferson Laboratory, Newport News, VA (USA) in 2017 to work on the characterization of the active part of the RICH detector.

Bando Lunga Mobilità 2017 **February 2017**
Università degli Studi di Ferrara
Grant to spend at least one month abroad for activities correlated to the PhD project:
I spent about six weeks at Jefferson Laboratory, Newport News, VA (USA) at the end of the summer to participate at the assembling of the active part of the detector.

Summary of Scientific Activities

CLAS12 Experiment (November 2014 - February 2018)

- **Radiation hardness characterization** of SiPM (Advansid e Hamamatsu).
- Assembling and preparation of the **test beam** on SiPM with neutrons in ENEA, Frascati.
- Assembling and preparation of the test beam on SiPM with gamma-rays in Istituto Superiore di Sanità, Frascati.
- Software filter implementation for SiPM signal to analyse the background current.
- **Software analysis** to detect single and multiple micro-cell discharges to investigate the radiation damage.
- **Stability studies** as a function of temperature and humidity on a prototype of the spherical mirrors, optical part of the RICH sector.
- **Preparation of the procedure** for the validation of the spherical mirrors.
- **Preparation of the cleaning room** for the spherical mirror validation with the Detector Support Group (DSG) at JLAB.
- **Validation** of the spherical mirrors before the final coating at JLAB.
- Stability studies on a superconducting bulk for holding transversely polarized targets.
- Validation of the electronics boards for the readout of the first sector of the RICH at JLAB.
- **Characterization** of the photon detector (Multi-Anode Photomultiplier) with the readout electronics for the first sector of the RICH at JLAB.
- **Assembling** of the photo-sensors and of the electronics readout on the final panel at JLAB.
- Analysis of the data collected from the **cosmic stand** with all the RICH active part instrumented.
- **Analysis** of the first data from SiPM matrices connected with the RICH readout electronics.
- **Participation to the shifts** for the Engineering and Physics run of CLAS12.
- **Expert on call** for the RICH detector for a month, while at JLAB.

HPS Experiment (May - July 2014)

- **Characterization** of the LED system for the HPS calorimeter.
- **Quality test and validation** of more than 400 LEDs.
- One month of stay at Jefferson Lab (JLAB), VA (USA).
- **Installation** of the LMS system on the final calorimeter.
- Validation of the Light Monitoring System just assembled.
- Internal memo to describe the work of installation and commissioning for the LMS.

$\bar{\text{P}}$**ANDA Experiment** (September 2012 - April 2014)

- **Assembling and participation** to the test beam for Single Event Upsets (SEU) studies on ToPix and GigaBit Laser Driver of the $\bar{\text{P}}$ANDA Micro Vertex Detector at the INFN National Laboratory of Legnaro, Padova.
- Studies of **energy loss** in different materials on the ToPix boards with dedicated software.
- **Data analysis** of the Triple Modular Redundancy system for the correction of the SEU in ToPix.
- Data analysis of the Triple Modular Redundancy system for the correction of the SEU in the configuration register for the GigaBit Laser Driver.
- Data analysis for baseline calibration and current absorption after neutrons irradiation.
- Assembling and participation to the test beam for the **tracking system** of the $\bar{\text{P}}$ANDA Micro Vertex Detector at Forschungzentrum, Julich.

Scientific Activities

BESIII EXPERIMENT

Quality assurance, installation and commissioning of the cylindrical GEM detector of the BESIII experiment

Supervisor: Gianluigi Cibinetto INFN Ferrara

I recently joined BESIII collaboration. An accelerator and a detector upgrade is now on going to deepen the knowledge in τ-charm energy region. A part of this project involves the installation of a cylindrical GEM (Gas Electron Multiplier) detector to improve the reconstruction of the primary and secondary vertices to access to more complicated decay topologies.

My work in the experiment started with a training period to better know the cylindrical GEM detector and the setup in Ferrara where there are a prototype of the middle cylindrical layer (L2) and the final innermost layer (L1). Working with a master student, I will start the activities related to quality assurance by means of a cosmic stand and a radioactive source scan. The expertise gained during the operation of the RICH detector will help me during the commissioning of each layer.

CLAS12 EXPERIMENT

Studies of innovative photon detectors working in the single-photon regime for the RICH detector of the CLAS12 experiment

Supervisor: Marco Contalbrigo INFN Ferrara

The PhD activities involve the work done to prepare the construction and the following installation of the RICH (Ring Imaging CHerenkov) detector for the CLAS12 (CEBAF, continuous electron beam facility, Large Acceptance Spectrometer at 12 GeV) at the Thomas Jefferson National Accelerator Facility (JLAB), Newport News, VA (USA). An upgrade of the facility allowed the installation of a new Cherenkov detector (RICH) to improve the hadrons detection in the momentum range between 3 and 8 GeV/c. This information will help the understanding process of the 3-dimensional structure of the nucleon focusing on the strangeness distributions.

The design of the detector has been studied to be hybrid in order to have high performance while satisfying the requirements of the experiment. It has an optic part composed by aerogel radiator and focusing mirrors (spherical and planar) to bring the Cherenkov photons on the active part composed by photon sensors together with the readout electronics [4,5]. My work focused mainly on the validation, quality control and assembling of the sensors with the readout electronics; moreover, I participated to the characterization studies of the spherical mirrors.

I started with the analysis of the Silicon Photomultipliers (SiPM) that will be used on the active part of the second sector that will compose the final RICH detector and that will be installed in 2020. I performed radiation damage studies starting with the participation to a test beam at ENEA in Frascati, where different SiPM prototypes have been irradiated with neutrons. The goals of this work were two: validate the use of this photon-detector for the RICH in the CLAS12 environment and develop an analysis procedure to be able to test and compare the results from different devices with always improving technology. The characterization of the SiPM signal involved a specific analysis of the background. This is doable thanks to the fact that thermal dark counts present the same signal as single-photons do. The devices have been also analysed with the standard characteristic curve of the absorbed current as a function of the bias voltage. I studied the background signal extracted with an oscilloscope at 2.5 Gb/s in a time window of 20 ms and I created a software filter to clean the SiPM signal from the slow component to be able to detect every single pulse and compare it to the one of a single photon. My analysis detects each pulse and define if it is single (good signal) or multiple (frequently correlated with noise) pulse to define the status before and after irradiation. Some relevant results from this analysis have been presented in the RICH2016 conference and published in a proceeding titled "Cherenkov light imaging tests with state-of-the-art solid state photon counter for the CLAS12 RICH detector" [6].

I continued my work for the RICH detector on the spherical mirror from the optical part by studying a spherical mirror prototype. Its performance have been studied as a function of temperature and humidity to validate their use in the experimental hall for the whole period of the CLAS12 experiment. I developed a procedure for the quality control of each component and for their validation after every step of the final production. Moreover I also studied a procedure for the final alignment of the whole mirror system. The win of the "Bando Lunga Mobilità" of the Ferrara University allowed me to participate, in collaboration with the Detector Support Group (DSG), to the preparation of the cleaning room and to actually performing the first tests on the first mirrors produced that needed a validation before coating. I finally introduced the DSG people to the procedure to allow them to perform the tests with my support from Italy.

In parallel with the RICH activities I helped with some stability measurements of a superconductive bulk of MgB_2 as a function of the temperature to understand the better condition in which work to hold a transversely polarized target [7].

During the second half of the PhD I won two other grants from Ferrara University, "Bando Giovani Ricercatori (fondi5X1000)" and "Bando Lunga Mobilità", that allowed me to spend about six month at the Jefferson Lab (JLAB). I prepared the components for the assembling of the active part of the first sector of the RICH detector: validation of the readout electronics boards, characterization of the Multi-Anode Photomultiplier with the RICH readout electronics, assembling and commissioning of the photon detector part of the RICH module. I started with a visual check of the whole instrumentation to control its status after the shipment and with some test to check the electrical connection between all the channels of all the boards. Then, I could connect together for the first time all the readout components of the final detector: an adapter board to connect MAPMTs to the ASIC board, the ASIC board it self to process the signal and the FPGA board for the configuration and data transfer. These three boards together with the photomultiplier is a unit of the detector defined tile. Each tile have been then characterized on a test bench setup inside a dark box with a pulsed laser to simulate the single-photon regime expected in the real working conditions. During this operation we collected data in different condition of high voltage, electronic gain, discriminating threshold or intensity of the laser. This allowed to prepare a reference database to define the best working point for the real acquisition and to monitor the status of the detector during the years of the experiment to eventually point out some damage due to ageing or radiation damage.

Once all the components were characterized and the data collected, the assembling could start. All the tiles had to be mounted on a mechanical support that guarantees rigidity and stability during the years of operation: it is a carbon fiber panel that keep separated the inner (MAPMTs and adapters) and the external (ASIC, FPGA and cables) part of the module. At first only one fourth of the electronic panel has been assembled to develop a proper procedure to deal with all the mechanical components. A cosmic stand has been prepared to validate also the trigger system, the acquisition system and the power supply. With the full procedure and the software part ready, the full assembling started. With all the electronics mounted on the panel, we run some test on the gas and the cooling system to be sure not to have any leak and that the electronic could be turned on without any problems. At the end we mounted the photomultipliers and prepared a cosmic stand to acquire data while the other passive components were mounted on the module. Back in Ferrara I started the analysis on this cosmic data while the full detector have been installed in the experimental area. I focused the analysis on the time resolution time to validate, one more time, the readout electronics developed for the RICH with this specific MAPMTs.

In the Ferrara laboratory, I also started the measurement on the SiPM matrices to test their use with the RICH readout electronics. The very first test done in the dark box with a pulsed laser allowed, indeed, to detect the signal and therefore to validate their use together.

Last month of the PhD overlapped with the engineering run and the start of the physics run of CLAS12. I spent at JLAB one month to participate to some shift and I have worked as expert on call for the RICH detector to monitor its activities in real conditions.

HPS EXPERIMENT

Characterization and Assembling of the Light Monitoring System for HPS experiment

Supervisors: Marco Battaglieri, Raffaella De Vita, Adriano Celentano INFN Genova

In the period between the master and the PhD I have worked together with Genova INFN colleagues to the characterization and assembling of the "Light Monitoring System (LMS)" for the calorimeter of the HPS (Heavy Photon Search) experiment at Jefferson Laboratory (JLAB), Newport News, VA (USA). This experiment foresees dark matter investigation with the detection of the dark photon that is predicted to be the vector boson of the dark matter sector.

I have started with a period in Genova for training to get to know the experiment and the system. Back in Torino with the instrumentation, I have started the validation and characterization test on the main component of the LMS: LED. I have finally moved to the American laboratory. There, I concluded the characterization of the LEDs with the final electronic boards following the instruction of the colleagues in Italy. Then, I participated to the assembling of the whole system and helped to validate that each component of the calorimeter (crystals and electronics) were working properly [3]. To conclude this experience on assembling and commissioning of the Light Monitoring System of the calorimeter for the HPS experiment, I prepared an internal note to map all the readout channels and to describe the work done.

$\bar{\text{P}}$ANDA EXPERIMENT

Study of radiation effects on prototypes of the $\bar{\text{P}}$ANDA Micro Vertex Detector

Supervisors: Michela Greco, Daniela Calvo INFN Torino

For my Master's Degree I have worked with the Torino group of the $\bar{\text{P}}$ANDA experiment. My line of work was developing and testing some prototypes of the Micro Vertex Detector (MVD), designed to be installed in FAIR (Facility for Antiproton and Ion Research), hosted at GSI in Darmstadt, Germany. The goal of this new experiment is to work with proton-antiproton interactions to investigate the charmonium and exotics sector. In particular, the Micro Vertex Detector aim is to improve the vertices reconstruction.

In particular, I have worked on the radiation hardness studies of two prototypes of the new readout system. The hadronic environment in which the MVD will operate, will strongly stress the electronics, with a very large integrated dose during the full lifetime of operations. The first prototype studied was the ASIC chip, called ToPix. The focus was on the study of the performance of the Triple Modular Redundancy (TMR) system, designed to recover the Single Event Upset (SEU) errors, that may occurs in one of the different registers that compose the system: configuration, leading edge and trailing edge. The second prototype studied was the GigaBit Laser Driver, GBLD, used for data communication and for ToPix configuration, with a particular attention to its I2C register, that contains the configuration bits. The system to recover for possible SEU errors is again the TMR one. The work aims to test the detector possibility to cope with the radiation for the full experiment lifetime.

The work was divided in two main parts: the first part was mainly focused on the preparation and participation to a beam test performed in INFN National Laboratory of Legnaro and in the following data analysis, while the second part was dedicated to the analysis of the data collected in the LENA laboratory in Pavia, to test the baseline calibration and current absorption after neutrons irradiation.

For the Legnaro beam test, I have studied the energy deposition in the different layers, which constitute the bulk of the electronics, and thus understand the expected damage. Then I have personally participated to the test, preparing the setup and, during the data acquisition, analysing the data online. The analysis was completed once returned to Torino. I have also developed an algorithm that was able to count the number of the errors in the different register. The data were studied in order to know the rate of SEU errors as a function of the different integrated doses to extrapolate the rate expected in the final experiment. [1,2]

The study on the damage due to the neutrons was perfumed with different prototypes built with different pixel matrix dimensions. For this activity I have studied the baseline calibration by means of a dedicated LabView program, studying a DAC register. I have verified that the studied correction system was able to correctly operate also after the irradiation. Moreover, I have studied the current absorption as a function of the applied bias voltage in order to compare the results before and after the irradiation.

These studied have allowed me to become familiar with the more relevant operation to test the quality of silica solid state detectors. During the Master's Degree I have also participated to a beam test at the Forschungzentrum Julich, in Julich, Germany. The goal of these tests was verify the performance of the first final modules and to test the tracking performance. For these tests, I have participated to setup assembly and to the data taking.

BACHELOR DEGREE

Analysis and discrimination of the breast density through digital tomosynthesis
Supervisors: Michela Greco INFN Torino, *Silvano Agliozzo* im3D S.p.A

For my Bachelor's Degree I have performed a three months internship in im3D, an external firm dedicated to the Medical Physics. During the internship I have worked with the data collected from digital tomosyntheses, performed on different patients in order to determine the breast density with a quicker and more reliable procedure to identify possible breast cancers. The digital tomosynthesis builds different projections of the considered volume and, by means of precise reconstruction techniques, allows to build a tridimensional picture of the breast and provide information without superimposition effects that may distort the results. My work was focused on the analysis of a series of breast lesions identified by a radiologist. The goal was learning to identify the possible lumps and to prepare an unambiguous procedure to classify them as a function of different parameters provided by the test. In this internship I have worked in the Matlab environment, with particular functions dedicated to the Medical Physics previously implemented from my internship supervisor.

Other Activities

Schools, Conferences and Collaboration Meetings

- **October 2013** XXIII DETECTORS CONFERENCE – F. Bonaudi School, Physics Department, Turin (Italy).
- **December 2013** LI PANDA Collaboration Meeting GSI – Darmastad (Germany) Talk in plenary session: "Study of Radiation Effects on Prototypes of the PANDA Micro Vertex Detector".
- **June 2014** 6° HPS COLLABORATION MEETING – Jefferson Laboratory - Newport News, VA (USA).
- **November 2015** VI National School "Rivelatori ed Elettronica per Fisica delle Alte Energie, Astrofisica, Applicazioni Spaziali e Fisica Medica" - Legnaro (PD).
- **May 2015** Ferrara International School Nicolò Cabeo 2015 "Infinities" - Ferrara (FE).
- **September 2015** International School of Nuclear Physics - Erice, Sicily (TP).
- **September 2016** 9th International Workshop on Ring Imaging Cherenkov Detectors (RICH 2016) - Poster and Proceeding : "Cherenkov light imaging with state-of-the-art solid state detectors" - Bled, Slovenia.
- **March 2017** CLAS Collaboration Meeting - Jefferson Laboratory - Newport News, VA (USA).
- **October 2017** CLAS Collaboration Meeting - Jefferson Laboratory - Newport News, VA (USA).

Periods Abroad

- **May - July 2014** Participation to the activities of charcterization and installation of the Light Monitoring System for the Heavy Photon Search (HPS) at Jefferson Laboratory - Newport News, VA (USA)
- **July - August 2016** "Bando per periodi di mobilità all'estero dei dottorandi" from Ferrara University: participation to the activities to test the optical components of the RICH detector for the CLAS12 experiment together with the Detector Support Group and preparation of the assembling of the full detector at the Jefferson Laboratory - Newport News, VA (USA)
- **November-Dicember 2016** Participation to the test of the readout electronics with the Multi-Anode Photomultiplier for the RICH detector at Jefferson Laboratory - Newport News, VA (USA)
- **February - June 2017** "Bando Giovani Ricercatori" from Ferrara University: participation to the calibration and characterization test of the active components for the RICH detector at Jefferson Laboratory - Newport News, VA (USA)
- **August - September 2017** "Bando per periodi di mobilità all'estero dei dottorandi" from Ferrara University: participation at the finalization of the characterization test of the components for the active part of the detector and at the starting of the assembling of the same components on the final mechanical support at Jefferson Laboratory - Newport News, VA (USA)
- **October 2017** "Bando per periodi di mobilità all'estero dei dottorandi" form Ferrara University: participation at the finalization of the assembling of the detector at Jefferson Laboratory - Newport News, VA (USA)
- **February 2018** Participation at the shifts of the Engineering and Physics runs for the CLAS12 experiment also as an expert on call for the RICH detector.

Teaching and Dissemination

- **February 2015** Modern Physiscs Laboratory of the Ferrara University for high school students: tutor for the lectures on "Measurements of the Planck constant" - Ferrara (FE).
- **September 2015** Scientific Guide at Unifestival - "Meet LHC".
- **October 2015 - January 2016** Scientific Guide for the exposition: "Fisica e Metafisica".
- **February 2016** Modern Physiscs Laboratory of the Ferrara University for high school students: tutor for the lectures on "Measurements of the Planck constant" - Ferrara (FE).
- **March 2016** International Physics Masterclass: tutor for the data analysis - Ferrara (FE).
- **June 2016** Summer stage at the physics department of Ferrara University: tutor for Nuclear physics lectures.
- **June 2017** Summer stage at the physics department of Ferrara University: tutor for Nuclear physics lectures.

Master Thesis - List of Exams

Relativistic Quantum Mechanics The course provides the peculiarities of the relativistic extension of the quantum mechanics in preparation to the quantum field theory studies.

Particle Detectors The course introduces the principal physics effects in the radiation matter interactions, their implications to the detection techniques, and their applications. It presents the state of the art in particle detectors, their usage and performance.

Nuclear and Sub-Nuclear Physics Lab - I The course provides both theoretical and experimental approach in order to perform nuclear and sub-nuclear physics experiments using particle detectors (scintillators and gas detectors).

Nuclear and Sub-Nuclear Physics Lab - II The course provides a general introduction to the most relevant particle detectors, their working principles and performance, and to their use in high energy nuclear and sub-nuclear physics. A more deep study was dedicated to bubble chambers, in order to understand how to extract information from photograms and to calculate branching ratio and cross sections directly from the pictures. Two dedicated activities prepare to understand how silicon tracking detectors work, also with the use of a professional probe-station to check a full characterization.

Elementary Particles I The course provides a quantitative knowledge of the Standard Model most important experimental results. The unified electroweak theory is left for the second part of the course.

Fundamental Interaction Phenomenology The course is meant to be an introduction to the general ideas of the Standard Model of particle physics and to some of its extension in a phenomenological framework. A particular focus is given to electroweak interaction, quantum chromodynamics, and neutrino physics. The presence of anomaly is explained: the approach of how to remove the most important anomalies and some of the extensions to the Standard Model are introduced.

Relativistic Kinematics and Particle Accelerator The course provides the understanding of the most important conservation law by means of a practical approach. A discussion of the role of the phase space factor in the perturbative approach to the scattering processes is given.

Microelectronics The course provides a strong knowledge to the CMOS integrated circuits, with a focus on the analog ones. A part of the course is dedicated to the circuit analysis technique and to the CAD simulations.

Elementary Particles II The course's goal is to complete the introduction to the particle physics provided in the first part with a focus on the experimental results that brought to the validation of the Standard Model.

Numerical Analysis and Simulation Techniques The course aims to strengthen the knowledge of how analyse experimental data, with a focus on the high energy ones. It introduces the most relevant Monte Carlo technique to simulate physical process and detectors.

Quantum Field Theory The course provides a general introduction to the most relevant features of the relativistic quantum field theory and discuss their applications. The arguments are described in a self-contained series of lectures that provides a comprehensive discussion of the Standard Model and to its more relevant experimental consequences.

General Relativity The course provides an introduction to the General Relativity, to the study of the spacetime structure, and to the Gravitation.

List of Publications

1. "Single-event upset tests on the readout electronics for the pixel detectors of the PANDA experiment", G.Mazza et al. 10.1088/1748-0221/9/01/C01042. JINST 9 (2014) no.01, C01042.

2. "Test for the mitigation of the Single Event Upset for ASIC in 130 nm technology" I.Balossino, D. Calvo, P.De Remigis, S. Mattiazzo, G. Mazza, R. Wheadon. PoS TIPP2014 (2014) 382.

3. "The HPS electromagnetic calorimeter" HPS Collaboration (I. Balossino et al.). arXiv:1610.04319 [physics.ins-det]. 10.1016/j.nima.2017.02.065. Nucl.Instrum.Meth. A854 (2017) 89-99.

4. "The large-area hybrid-optics RICH detector for the CLAS12 spectrometer" M. Mirazita et al. 10.1016/
j.nima.2017.01.020. Nucl.Instrum.Meth.A (2016)

5. "Aerogel mass production for the CLAS12 RICH: Novel characterization methods and optical performance" M.Contalbrigo at al. 10.1016/j.nima.2017.02.068 Nucl.Instrum.Meth.A (2016)

6. "Cherenkov light imaging tests with state-of-the-art solid state photon counter for the CLAS12 RICH detector", I. Balossino et al. https://doi.org/10.1016/j.nima.2017.01.074. Nucl.Instrum.Meth.A (2016)

7. "A bulk superconducting MgB_2 cylinder for holding transversely polarized targets" M. Statera et al. 10.1016/
j.nima.2017.10.051. Nucl.Instrum.Meth. A882 (2017) 17-21.

8. "Dark Matter Search in a Beam-Dump eXperiment (BDX) at Jefferson Lab" BDX Collaboration (M. Battaglieri et al.). arXiv:1607.01390 [hep-ex].

9. "Target and beam-target spin asymmetries in exclusive pion electroproduction for $Q^2 > 1\,GeV^2$. II. $ep \leftarrow e\pi^0 p$" CLAS Collaboration (P.E. Bosted et al.). arXiv:1611.04987 [nucl-ex]. 10.1103/PhysRevC.95.035207. Phys.Rev. C95 (2017) no.3, 035207.

10. "Photon beam asymmetry Σ for η and η' photoproduction from the proton" P. Collins et al. arXiv:1703.00433 [nucl-ex]. 10.1016/j.physletb.2017.05.045. Phys.Lett. B771 (2017) 213-221.

11. "Determination of the proton spin structure functions for 0.05¡Q^2 ¡5 GeV^2 using CLAS", CLAS Collaboration (R.Fersch et al.). arXiv:1706.10289 [nucl-ex]

12. "Measurement of the Q^2-dependence of the deuteron spin structure function g_1 and its moments at low Q^2 with CLAS" CLAS Collaboration (K.P. Adhikari et al.). arXiv:1711.01974 [nucl-ex].

13. "Measurement of the beam asymmetry Σ and the target asymmetry T in the photoproduction of ω mesons off the proton using CLAS at Jefferson Laboratory" CLAS Collaboration (P. Roy et al.). arXiv:1711.05176 [nucl-ex].

14. "Hard exclusive pion electroproduction at backward angles with CLAS", K. Park et al. arXiv:1711.08486 [nucl-ex]

15. "Dark matter search in a Beam-Dump eXperiment (BDX) at Jefferson Lab: an update on PR12-16-001", BDX Collaboration (M. Battaglieri et al.). arXiv:1712.01518 [physics.ins-det]

16. "Double K^0_S Photoproduction off the Proton at CLAS" CLAS Collaboration (S. Chandavar et al.). Phys.Rev. C97 (2018) no.2, 025203 DOI: 10.1103/PhysRevC.97.025203

17. "Exclusive photoproduction of π^0 up to large values of Mandelstam variables s, t and u with CLAS" CLAS Collaboration (M.C. Kunkel et al.). arXiv:1712.10314 [hep-ex]