

## PREFACE

“Diffraction and Low- $x$ ” is a joint effort between the “Diffraction” and “Low- $x$ ” workshop series. The purpose of this workshop is to stimulate discussions between experimentalists and theorists in diffractive hadronic and nuclear physics, ultraperipheral collisions and photon–photon physics, QCD dynamics at low- $x$ , parton saturation, spin physics and open problems in QCD at HERA, Tevatron, LHC, RHIC, and the future EIC.

“Diffraction” is a biennial workshop dedicated to theoretical and experimental progress in diffractive processes at high energies. The previous events took place in Cetraro (2000), Alushta (2002), Cala Gonone (2004), Milos (2006), La Londe-les-Maures (2008), Otranto (2010), Lanzarote (2012), Primošten (2014), and Acireale (2016).

“Low- $x$ ” is an annual workshop whose spirit is to favour fruitful and informal discussions between experimentalists and theorists in low- $x$ , diffractive hadronic physics and open problems in QCD at HERA, Tevatron and the LHC. “Low- $x$ ” has been held since DESY (1993), then Saclay (May 1994), Cambridge (July 1995), Durham (June 1996), Madrid (June 1997), Berlin (June 1998), Tel Aviv (June 1999), Oxford (July 2000), Cracow (June 2001), Antwerpen (September 2002), Nafplio (June 2003), Prague (September 2004), Sinaia (June 2005), Lisbon (June 2006), Helsinki (September 2007), Crete (July 2008), Ischia (September 2009), Kavala (June 2010), Santiago de Compostela (June 2011), Cyprus (June 2012), Eilat (June 2013), Kyoto (June 2014), Sandomierz (September 2015), Gyongyos (June 2016), Bisceglie (June 2017), Nicosia (August 2019), Elba (September 2021), Leros (September 2023).

The previous joint workshops “Diffraction and Low- $x$ ” were held in Reggio Calabria (2018) and Corigliano Calabro (2022).

The conference venue of “Diffraction and Low- $x$  2024” was the Hotel Tonnara in Trabia (Palermo), Italy, 8–14 September, 2024.

“Diffraction and Low- $x$  2024” was attended by 103 in-person participants; 21 different countries from all over the world were represented, with a broad presence of Ph.D. students and young post-docs. During the workshop, 83 talks were given and 11 posters were presented, the latter being preceded by flash talks. They covered recent theoretical and experimental progress in diffractive and low- $x$  hadronic processes at high energies. The main topics were:

- (i) diffraction in  $e$ - $p$  and  $e$ -ion collisions,
- (ii) diffraction in  $p$ - $p$  and nucleus-nucleus collisions,
- (iii) low- $x$ , PDFs, and saturation,
- (iv) results on QCD and hadronic final states,
- (v) spin physics,
- (vi) ultraperipheral collision and  $\gamma$ - $\gamma$  physics.

Most of the contributions are summarized in these proceedings.

The workshop was jointly organized and sponsored by Istituto Nazionale di Fisica Nucleare (INFN, Italy), Università della Calabria (Italy) and The University of Kansas (United States). It received valuable sponsorship also from EMMI (Darmstadt, Germany), Center for Frontiers in Nuclear Science (Stony Brook, United States), and CERN (Geneva, Switzerland).

The organizers wish to thank all people who have contributed to the realization of this workshop: the members of the International Advisory Committee for their helpful suggestions, the conveners of the different sessions (Rachel Montgomery, Marta Ruspa, Zhoudunming Tu; Lucian Harland Lang, Ken Osterberg, Murilo Rangel, Rafał Staszewski; Francesco Giuli, Tuomas Lappi, Roman Lavicka; Marco Bonvini, Cristian Baldenegro, Josu Cantero Garcia, Francesco G. Celiberto; Barbara Badełek, Umberto D'Alesio; Lydia Beresford, Victor Gonçalves, Georgios Krintiras, Riccardo Longo) for setting up an interesting scientific program, and all the presenters and attendees for their contributions and for making this workshop a success. We acknowledge the valuable technical support of Vittorio Romano (University of Calabria & INFN-Cosenza). Finally, we would like to thank the Editors of *Acta Physica Polonica B Proceedings Supplement*, for accepting to host the proceedings of the Workshop and for the helpful collaboration at all stages.

As in the previous “Diffraction and Low- $x$ ” events, the best presentations by Junior Scientists were awarded, according to the following high-quality criteria: clearness in the presentation, relevance of the results and promptness in answering questions. A jury formed by members of the International Advisory Committee and Conveners participating in the workshop decreed as award winners two speakers and two poster presenters: C.E. Leitgeb, with the talk «Future LHC Measurements for Cosmic Ray Induced Air Shower Modelling», and T. Mäkelä, with the talk «Deep-inelastic scattering with collider neutrinos at the LHC and beyond»; B.C. Kovács, with the poster «D0 production in UPC Pb-Pb collisions at 5.36 TeV measured in  $0nXn$  events with rapidity gap» and M. Svěráková, with the poster «Study of the  $J/\psi$  photoproduction with tagged forward proton in  $p + p$  collisions at  $\sqrt{s} = 510$  GeV».

Repeating the experience of the previous “Diffraction and Low- $x$ ” events, delegates from two high schools in Sicily were invited to participate in the workshop activities and to attend an introductory lecture to particle physics given by Professor Christophe Royon. The selected high schools were the Istituto Superiore “Majorana” in Palermo, with the students Angelo Catalinotto, Mattia Li Pira, Andrea Parrino, Christian Rosone, Francesco Taormina, accompanied by Professor Salvatore Spagnolo, and the Liceo Scientifico Statale “S. Cannizzaro” in Palermo, with the students Massimo Aversa, Giulio Corsetti, Livio Fragale, Andrea Parisi, accompanied by Professor Silvia Busacca, and Professor Rosaria Melilli.

The nice atmosphere of the workshop depended on the harmonic interplay between scientific content, people, and surroundings. So, let us conclude by remembering some highlights of the days of the workshop: the excursion to the town of Palermo, with a visit to the complex of Santa Caterina d’Alessandria, known for its rich Baroque marble inlays, where we tasted the *cannoli* made with the ancient recipes of the convent’s nuns, and, last but not least, the social dinner in the charming Palazzo Branciforte in Palermo.

We look forward to “Diffraction and Low- $x$  2026”.

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