

## PREFACE

“Diffraction and Low- $x$  2022” is a joint effort between the “Diffraction” and “Low- $x$ ” workshop series. The purpose of this workshop was to stimulate discussions between experimentalists and theorists in diffractive hadronic physics, QCD dynamics at low- $x$ , parton saturation, and open problems in QCD at HERA, Tevatron, LHC, RHIC, and the future EIC.

The conference venue was the BV Airone Resort in Corigliano Calabro (Cosenza), Italy, September 24–30, 2022.

“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 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).

The previous joint workshop “Diffraction and Low- $x$ ” was held in Reggio Calabria (2018).

“Diffraction and Low- $x$  2022” was attended by 91 in-person participants plus 3 participants who had to convert their attendance into a remote one, due to last-minute inconveniences; 22 different countries from all over the world were represented, with a broad presence of Ph.D. students and young post-docs. During the workshop, 91 talks were given, which 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) soft diffraction,
- (iii) photon-photon physics and hard diffraction,
- (iv) spin physics,
- (v) recent theoretical results on QCD and saturation,
- (vi) low- $x$ , PDFs, and hadronic final states.

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), The University of Kansas (United States). It received valuable sponsorship from EMMI (Darmstadt, Germany), CERN (Geneva, Switzerland) and the Consiglio Regionale della Regione Calabria. It received also an appreciated contribution from the house Caffè Aiello.

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 invaluable suggestions, the conveners of the different sessions (M. Ruspa, D. Tapia Takaki, B. Kopeliovich, R. McNulty, K. Osterberg, J. Murillo, M. Pitt, M. Rangel, B. Badelek, U. D'Alesio, F.G. Celiberto, M. Hentschinski, C. Marquet, A. Sabio Vera, C. Baldenegro, M. Bonvini, A. Cooper-Sarkar, P. Nadolsky) for setting up an interesting scientific program, and all the speakers and attendees for their contributions and for making this workshop a success. We acknowledge the administrative support of Rita Bertelli (LNF-INFN) and Luigina Sciommarella (University of Calabria) and the valuable technical support of Vittorio Romano (University of Calabria). Finally, we would like to thank the Editors of *Acta Physica Polonica B*, for accepting to host the proceedings of the workshop and for the helpful collaboration at all stages.

For the first time in this series of events, we introduced an award for the 'Best theoretical talk' and 'Best experimental talk', to be assigned to Junior Scientists according to the following high-quality criteria: clearness in the presentation, relevance of the results, promptness in answering questions. A jury formed by members of the International Advisory Committee and Conveners participating in the workshop decreed as award winners Dr. Farid Salazar, for the talk "Sudakov suppression and gluon saturation at NLO" (theory) and Dr. Florian Lorkowski, for the talk "Impact of jet-production data on the next-to-next-to-leading-order determination of HERAPDF2.0 parton distributions" (experiment).

Repeating the experience of the previous "Diffraction and Low- $x$ " event, delegates from two high schools in Calabria were invited to participate in the workshop activities and to attend an introductory lecture to particle physics held by prof. Christophe Royon. The selected high schools were the Liceo "A. Volta" in Reggio Calabria, with the students Sofia Cilea, Giovanni Gatto, Maria Pia Nadia Geremia, Denise Mammì, Andrea Martorano, Raffaele Novelli, accompanied by prof. Carmen Petronio, and the "Polo liceale" in Rossano (Cosenza), with the students Francesco Benincasa, Giuseppe Brunetto, Rebecca De Vico, Chiara Giuliani, Ludovica Madeo, Denise Mirra accompanied by prof. Elvira Luisa Marchianò and prof. Mariassunta Sapia.

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 Rossano, known as the “Ravenna of the South”, with its countless Byzantine testimonies and the diocesan museum where the famous “Codex Purpureus Rossanensis”, an ancient manuscript dating back to the 5<sup>th</sup>–6<sup>th</sup> century, is kept; the excursion to Civita, a delightful village of Albanian origin, and Spezzano Albanese, most welcoming with its folklore music and local delicatessen; the guided tour of the archaeological site of the Magna-Graecia great “polis” of Sybaris, and, last but not least, the memorable social dinner in the sumptuous Ducal castle of Corigliano Calabro.

We look forward to “Diffraction and Low- $x$  2024”.

*Marcella Capua, Luigi Delle Rose  
Salvatore Fazio, Roberto Fiore  
Evelin Meoni, Andrea Nava  
Alessandro Papa, Marco Rossi  
Christophe Royon, Enrico Tassi*