

CHEP 2023: Preface to the Proceedings

Brad Sawatzky^{1,*}, *Amber Boehnlein*^{1,**}, *Graham Heyes*^{1,***}, *Raffaella De Vita*^{1,2}, *Xavier Espinal*³, *Paul Laycock*⁴, and *Oksana Shadura*⁵

¹Thomas Jefferson National Lab, USA

²INFN, Italy

³CERN, Switzerland

⁴Brookhaven National Lab, USA

⁵University of Nebraska-Lincoln, USA

Abstract. The 26th International Conference on Computing in High Energy and Nuclear Physics (CHEP), organized by Jefferson Lab, took place in Norfolk, Virginia from 5–11 May 2023. The conference attracted 581 registered participants from 28 different countries. There were scientific presentations made over the 5 days of the conference. These were divided between 20 long talks and 2 keynotes, which were presented in plenary sessions; 450+ short talks, which were presented in parallel sessions; and 140+ posters split over two dedicated sessions.

1 Foreword

It is with great pleasure that we present the Proceedings for the [26th CHEP conference](#). It has been a long road! In 2018 Jefferson Lab won the bid to host the 25th CHEP originally planned for May 2021 in Norfolk, Virginia. Unfortunately nature had other plans and COVID-19 threw a wrench into the works making in-person conferences impossible for years. CERN offered to host a *virtual* vCHEP 2021 in May 2021 to fill the gap and maintain the publication cadence for researchers. This became the 25th CHEP. While the world wrestled with travel restrictions and policy changes the Norfolk CHEP, now the 26th, was ultimately deemed a ‘go’ for May 2023, five years after we initially started planning for this conference.

We on the Local Organizing Committee are *greatly* indebted to the Program Committee, Track Conveners, and International Advisory Committee for their outstanding and invaluable support as we navigated this path. It was clear that the CHEP community was eager to restart in-person meetings, and we are grateful for the wonderful engagement and hard work demonstrated in the conference presentations and now reflected in these Proceedings. With 581 registrants, 450+ oral presentations, and 140+ posters, CHEP 2023 was a very successful return to an in-person CHEP conference format after the COVID constraints of 2019–2022.

It was a wonderful experience for Jefferson Lab to host the CHEP community in Norfolk, Virginia last year. We look forward to seeing you at [CHEP 2024](#) to be held in Krakow, Poland on 21–25 October 2024!

*e-mail: brads@jlab.org

**e-mail: amber@jlab.org

***e-mail: heyese@jlab.org

2 CHEP Conference Series

The CHEP conferences address the computing, networking and software issues for the world's leading data-intensive science experiments that currently analyze hundreds of petabytes of data using worldwide computing resources. The Conference provides a unique opportunity for computing experts across Particle and Nuclear Physics to come together and learn from each other.

The inaugural CHEP conference took place in 1985 and has continued with a roughly 18 month cadence since that time. Table 1 provides a list of past conferences with URLs where available.

Table 1. Dates and Locations of previous CHEP conferences.

Name	Dates	Location
CHEP'85	25–28 June 1985	Amsterdam, Netherlands
CHEP'87	2–6 February 1987	Asilomar, California, USA
CHEP'89	10–14 April 1989	Oxford, England, United Kingdom
CHEP'90	9–13 April 1990	Santa Fe, New Mexico, USA
CHEP'91	11–15 March 1991	Tsukuba, Japan
CHEP'92	21–25 September 1992	Annecy, France
CHEP'94	21–27 April 1994	San Francisco, California, USA
CHEP'95	18–22 September 1995	Rio de Janeiro, Brazil
CHEP'97	7–11 April 1997	Berlin, Germany
CHEP'98	31 August–4 September 1998	Chicago, Illinois, United States
CHEP'2000	7–11 February 2000	Padova, Italy
CHEP'01	3–7 September 2001	Beijing, China
CHEP'03	24–28 March 2003	San Diego, California, USA
CHEP'04	27 September–1 October 2004	Interlaken, Switzerland
CHEP'06	13–17 February 2006	Mumbai, India
CHEP'07	2–7 September 2007	Victoria, British Columbia, Canada
CHEP'09	21–27 March 2009	Prague, Czech Republic
CHEP'10	18–22 October 2010	Taipei, Taiwan
CHEP'12	21–25 May 2012	New York, New York, USA
CHEP'13	14–18 October 2013	Amsterdam, Netherlands
CHEP'15	13–17 April 2015	Okinawa, Japan
CHEP'16	10–14 October 2016	San Francisco, California, USA
CHEP'18	9–13 July 2018	Sofia, Bulgaria
CHEP'19	4–8 November 2019	Adelaide, Australia
vCHEP'21	17–21 May 2021	Virtual event hosted by CERN

3 CHEP 2023 Conference

The CHEP 2023 Convergence was hosted by Thomas Jefferson National Lab (JLab) and held at the Norfolk Waterside Marriott in Norfolk, Virginia, USA. Running from 5–11 May 2023, the conference hosted roughly 600 attendees from 28 different countries.

The focus of the CHEP conference evolves with time to highlight changing technologies and major scientific initiatives. Through the plenary sessions, related scientific and computing topics are presented to ensure a broad and thoughtful program that engages the community. This edition of the conference placed special emphasis on high-performance data organization, management, and access (DOMA), a topic of interest and relevance throughout the scientific community.



Figure 1. Photo of Conference attendees taken at CHEP'23 in Norfolk, Virginia.

3.1 Program Details

The scientific program for CHEP'23 involved morning plenary sessions throughout the week, 12 parallel session tracks¹, and a DEI Roundtable session titled “Building an equitable STEM workforce for the future”.

The plenary sessions involved 20 invited long talks and 2 keynotes over the course of the week. 450+ short talks were presented during the parallel session tracks (Table 2) which focused on specific topics and had animated discussions on the technical merits of various approaches. Ad-hoc “Birds of a Feather” meetings promoted international communities of common interest. More than 140 posters were also presented through 2 dedicated poster sessions. The final day wrapped up the conference with a series of Track Summary presentations and the announcement of [CHEP'2024](#) to be held in Krakow, Poland on 21–25 October 2024.

The [CHEP'23 Conference](#) and [Indico](#) sites contain a record of the presentations, posters, photos, as well as video recordings of the Plenary sessions.

3.2 Organization

The organizational structure for CHEP consists of a Program Committee (PC) that oversees the program content; an International Advisory Committee (IAC), which sets the overall themes of the conference; and a Local Organizing Committee (LOC) that supports the PC with the program, is responsible for local arrangements (lodging, transportation, social events, etc.) and conference logistics (registration, program scheduling, conference site selection, conference proceedings, etc.).

¹Tracks 10–12 were merged into a combined *Track X* during parallel sessions for logistical reasons.

Table 2. Parallel Session Tracks.
(Tracks 10–12 were merged into a combined Track X for the CHEP23 parallel sessions.)

Track	Description / Keywords
Track 1: Data and Metadata Organization, Management and Access	Storage management frameworks; data access protocols; object, meta-data and event store systems; content delivery and caching; data analytics; FAIR data principles; non-event data; data classification; online and offline databases.
Track 2: Online Computing	Data acquisition; high-level triggers; streaming and trigger-less data acquisition; online data calibration; online reconstruction; real-time analysis; event building; configuration and access controls; detector control systems; real-time analytics and monitoring; trigger techniques and algorithms; hardware trigger algorithms.
Track 3: Offline Computing	MC event generation; detector simulation; fast simulation; offline reconstruction; detector calibration; detector geometries; data quality systems; data preparation; physics performance.
Track 4: Distributed Computing	Grid middleware; monitoring and accounting frameworks; security models and tools; distributed workload management; federated authentication and authorization infrastructures; middleware databases; software distribution and containers; heterogeneous resource brokerage.
Track 5: Sustainable and Collaborative Software Engineering	Software frameworks; collaborative software; sustainable software; software management, continuous integration; software building; testing and quality assurance; software distribution; programming techniques and tools; integration of external toolkits.
Track 6: Physics Analysis Tools	Analysis algorithms; object identification; object calibration; analysis workflows; lattice QCD; theory calculations; high performance analysis frameworks.
Track 7: Facilities and Virtualization	Cloud resources; HPC and supercomputers; deployment of virtual machines and container technologies; anything-as-a-service; private and commercial clouds; dynamic provisioning; networking; computing center infrastructure; management and monitoring; analysis facilities.
Track 8: Collaboration, Reinterpretation, Outreach and Education	Collaborative tools; reinterpretation tools; analysis preservation and reuse; data preservation for collaboration; outreach activities; open data for outreach; training initiatives; event displays; open science cloud initiatives.
Track 9: Artificial Intelligence and Machine Learning	Machine learning algorithms; machine learning for online; machine learning for simulation and reconstruction; machine learning tools and techniques for analysis; machine learning for reinterpretation; massive scale machine learning; hyperparameter optimization.
Track 10: Exascale Science	Algorithm scaling; exascale computing models; exabyte-scale datasets; exaflop computing power; generic algorithms; weak scaling.
Track 11: Heterogeneous Computing and Accelerators	Compute accelerators; concurrency in software frameworks; accelerator-as-a-service; FPGA programming; software design and implementation for heterogeneous architectures; heterogeneous resource usage for online and offline.
Track 12: Quantum Computing	Quantum computing for theory calculations; quantum computing for event generation, simulation and reconstruction; quantum computing for analysis; quantum computing applications.

3.2.1 Program Committee

The Program Committee chairs (Table 3) play an enormous role in the execution of a CHEP conference. Their duties include the following.

- Determine the scientific structure of the parallel sessions taking high-level guidance from the IAC and conference chairs. Work with the IAC and conference chairs on the total conference structure including plenary sessions and speakers.

- Propose additional members of the PC to help in abstract selection and parallel session formation and organization.
- Organize the review and selection of abstracts, ensuring, as far as possible, a common set of quality and relevance standards.
- Propose a track structure for the selected talks and a session organization for selected posters.
- Appoint Track Conveners, where possible from the existing PC and IAC membership.
- Oversee the submission of papers; appoint referees; oversee the use of the paper review system by Track Conveners, encouraging the submission of amended papers where necessary, and the timely completion of the peer review process.

Table 3. Program Committee Co-Chairs

Name	Affiliation
Raffaella De Vita	JLab and INFN, Italy
Xavier Espinal	CERN, Switzerland
Paul Laycock	Brookhaven National Lab, USA
Oksana Shadura	University of Nebraska-Lincoln, USA

3.2.2 Track Conveners

The Track Conveners (Table 4) supported the PC chairs in review and promotion of presentations prior to the conference, participated in running the parallel sessions during the conference, and played critical editorial roles developing this Proceedings post-conference.

3.2.3 International Advisory Committee

The International Advisory Committee (Table 5) is a large group with experience of previous CHEP conferences and are experts in the field. Their role is to advise the Program Committee and Local Organizing Committee.

3.2.4 Local Organization Committee

The CHEP 2023 conference was chaired by Amber Boehnlein, Graham Heyes, and Brad Sawatzky. The chairs wish to ephasize the fantastic support of the entire Local Organizing Committee (Table 6). Realizing CHEP'23 was a uniquely long road with many unexpected bumps. Thank you all for sticking with the project and executing it so well!

Table 4. Track Conveners

Name	Affiliation	Name	Affiliation
Roel Aaij	Nikhef	Claire Antel	Ruprecht-Karls-Universität Heidelberg
Marilena Bandieramonte	U. of Pittsburgh	Martin Barisits	CERN
Fernando Barreiro	U. of Texas at Arlington	Diego Davila	UCSD
Markus Diefenthaler	JLab	Katy Ellis	STFC-SCD
Giulio Eulisse	CERN	Elena Gazzarrini	CERN
Stephan Hageboeck	CERN	David Heddle	Christopher Newport U.
Alexander Held	U. of Wisconsin-Madison	Rohini Joshi	SKA
Kolja Kauder	BNL	Michael Kirby	FNAL
Tomoe Kishimoto	Kobe Univ.	Clemens Lange	PSI
Mario Lassnig	CERN	Verena Martinez	U. of Mass. Amherst
Hideki Miyake	KEK	Felice Pantaleo	CERN
Stefano Dal Pra	CNAF, INFN	Wahid Redjeb	CERN
Eduardo Rodrigues	U. of Liverpool	André Sailer	CERN
Jana Schaarschmidt	U. of Washington	Liz Sexton-Kennedy	FNAL
Ruben Shahoyan	CERN	Nicole Skidmore	U. of Manchester
Norraphat Srimanobhas	Chulalongkorn Univ.	Steve Timm	FNAL
Sofia Vallecorsa	CERN	Michel Hernandez Villanueva	Desy
Derek Weitzel	U. of Nebraska-Lincoln	Sandro Christian Wenzel	CERN
Arne Wiebalck	CERN	Satoru Yamada	KEK
Tingjun Yang	FNAL		

Table 5. International Advisory Committee

Name	Affiliation	Name	Affiliation
Sang Un Ahn	KISTI	Mohammad Al-Turany	GSI
Julia Andreeva	CERN	Latchezar Betev	CERN
Ian Bird	CERN	Catherine Biscarat	L2IT (CNRS/IN2P3, UT3)
Tommaso Boccali	INFN Pisa	Concezio Bozzi	INFN Ferrara
David Britton	Glasgow	Simone Campana	CERN
James Catmore	Oslo	Marco Cattaneo	CERN
Gang Chen	IHEP	Peter Clarke	Edinburgh
Caterina Doglioni	Lund	Peter Elmer	Princeton Univ.
Alessandra Forti	Manchester	Patrick Fuhrmann	DESY
Maria Girone	CERN	Heather Gray	UC Berkeley/LBNL
David Groep	Nikhef	Takanori Hara	KEK
Peter Hristov	CERN	Paul Jackson	Univ. of Adelaide
Michel Jouvin	IJCLab (CNRS/IN2P3)	Waseem Kamleh	Univ. of Adelaide
Jerome Lauret	BNL	Paul Laycock	BNL
Gonzalo Merino	PIC/CIEMAT	Bronson Messer	ORNL
Richard Mount	SLAC (Retired)	Niko Neufeld	CERN
Stefano Piano	INFN sez. Trieste	Danilo Piparo	CERN
Ghita Rahal	IN2P3/CNRS	Stefan Roiser	CERN
Heidi Schellman	Oregon State	Pat Scott	Univ. of Queensland
Elizabeth Sexton-Kennedy	FNAL	Hannah Short	CERN
Lucia Silvestris	INFN Bari	Simon	Fraser, TRIUMF
Oxana Smirnova	Lund	Randall Sobie	Victoria
Graeme A. Stewart	CERN	Reda Tafirout	TRIUMF
Ikuo Ueda	KEK	Raffaella De Vita	INFN
Gordon Watts	Univ. of Washington	Torre Wenaus	BNL
Andreas Wicenec	UWA/ICRAR	Eric Yen	Academia Sinica

Table 6. Local Organizing Committee

Name	Affiliation
Amber Boehnlein (Co-chair)	JLab
Graham Heyes (Co-chair)	JLab
Brad Sawatzky (Co-chair)	JLab
David Abbott	JLab
Ed Brash	CNU
Logan Chappell	JLab
Taylor Childers	ANL
Paul Letta	JLab
Brent Morris	JLab
Terryn Morton	JLab
Anita Seay	JLab
Lisa Surles-Law	JLab

4 Sponsors

Primary support for the CHEP 2023 conference was provided by Thomas Jefferson National Lab, Jefferson Science Associates (JSA), DOE / Office of Nuclear Physics, DOE / Office of High Energy Physics, and the International Union of Pure and Applied Physics (IUPAP). Additional support was provided by ideas4hpc, Dell Technologies, SEAL Storage Technologies, CTG Federal, Sycomp, IBM, SuperMicro, WEKA, and CAEN Technologies.



Figure 2. Sponsors for CHEP'23.