

DESY Summerstudent Lecture Programme 2023

Report of Contributions

Contribution ID: 1

Type: **not specified**

Introduction to HEP 1

Wednesday 19 July 2023 11:30 (45 minutes)

This is a basic introduction to the world of particle physics addressing all physicists and requiring no pre-knowledge on the topic.

Presenter: GEISER, Achim (CMS (CMS Fachgruppe QCD))

Track Classification: General Lectures

Contribution ID: 2

Type: **not specified**

Introduction to HEP 2

Thursday 20 July 2023 11:30 (45 minutes)

Presenter: GEISER, Achim (CMS (CMS Fachgruppe QCD))

Track Classification: General Lectures

Contribution ID: 3

Type: **not specified**

Introduction to HEP 3

Friday 21 July 2023 10:00 (45 minutes)

Presenter: GEISER, Achim (CMS (CMS Fachgruppe QCD))

Track Classification: General Lectures

Contribution ID: 4

Type: **not specified**

Introduction to HEP 4

Friday 21 July 2023 11:00 (45 minutes)

Presenter: GEISER, Achim (CMS (CMS Fachgruppe QCD))

Track Classification: General Lectures

Contribution ID: 5

Type: **not specified**

Introduction to Photon Science 1

Wednesday 19 July 2023 09:30 (45 minutes)

Primary author: SCHWOB, Lucas (FS-BIG (Biomolekuele in Gasphase))

Presenter: SCHWOB, Lucas (FS-BIG (Biomolekuele in Gasphase))

Track Classification: General Lectures

Contribution ID: 6

Type: **not specified**

Introduction to Photon Science 2

Wednesday 19 July 2023 10:30 (45 minutes)

Presenter: SCHWOB, Lucas (FS-BIG (Biomolekuele in Gasphase))

Track Classification: General Lectures

Contribution ID: 7

Type: **not specified**

Introduction to Photon Science 3

Thursday 20 July 2023 09:30 (45 minutes)

Presenter: SCHWOB, Lucas (FS-BIG (Biomolekuele in Gasphase))

Track Classification: General Lectures

Contribution ID: 8

Type: **not specified**

Introduction to Photon Science 4

Thursday 20 July 2023 10:30 (45 minutes)

Presenter: SCHWOB, Lucas (FS-BIG (Biomolekuele in Gasphase))

Track Classification: General Lectures

Contribution ID: 9

Type: **not specified**

Accelerator physics 1

Monday 24 July 2023 10:30 (45 minutes)

After a quick overview on applications of accelerators (HEP, light sources, medicine and industry), we present with an example how we work with accelerators in the control room and explain some basic concepts of beam dynamics in accelerators. The second main goal of these lectures is to describe the physical principles and key technologies that make possible the acceleration of charged particles up to TeV energies. We explain also the way particle colliders are built in order to bring high energy beams into collision with enough luminosity for the discovery of new particles and new physical processes. Special emphasis is made on superconducting technology for acceleration and bending of high energy beams.

Presenter: CASTRO-GARCIA, Pedro (MPY (Beschleunigerphysik))

Track Classification: General Lectures

Contribution ID: **10**

Type: **not specified**

Accelerator physics 2

Monday 24 July 2023 11:30 (45 minutes)

Presenter: CASTRO-GARCIA, Pedro (MPY (Beschleunigerphysik))

Track Classification: General Lectures

Contribution ID: **11**

Type: **not specified**

Accelerator physics 3

Tuesday 25 July 2023 10:30 (45 minutes)

Presenter: CASTRO-GARCIA, Pedro (MPY (Beschleunigerphysik))

Track Classification: General Lectures

Contribution ID: **12**

Type: **not specified**

Accelerator physics 4

Tuesday 25 July 2023 11:30 (45 minutes)

Presenter: CASTRO-GARCIA, Pedro (MPY (Beschleunigerphysik))

Track Classification: General Lectures

Contribution ID: **13**Type: **not specified**

Dark Matter 1

Thursday 27 July 2023 10:30 (45 minutes)

This lecture is focusing on evidences for dark matter in the universe and the axion as one of the prime dark matter candidates. Furthermore, astrophysical motivations for the existence of axions are discussed.

Presenters: LINDNER, Axel (ALPS (ALPS _ Any Light Particle Search)); SCHWEMMBAUER, Christina (ALPS (ALPS _ Any Light Particle Search)); RUBIERA GIMENO, Jose Alejandro (ALPS)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 14

Type: **not specified**

Dark Matter 2

Thursday 27 July 2023 11:30 (45 minutes)

In this lecture different basic approaches for axion search experiments are presented and the ALPS II experiment at DESY, which started data taking in May 2023, is discussed in some detail. In addition, actual PhD theses in the context of ALPS II are sketched, including opportunities for other direct dark matter searches.

Presenters: LINDNER, Axel (ALPS (ALPS _ Any Light Particle Search)); SCHWEMMBAUER, Christina (ALPS (ALPS _ Any Light Particle Search)); RUBIERA GIMENO, Jose Alejandro (ALPS)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 15

Type: **not specified**

Astroparticle Physics 1

Friday 28 July 2023 10:30 (45 minutes)

I will give a short introduction in the physics and detection method of high-energy astrophysics. This includes a discussion of the highest energetic particles in the Universe, well beyond what can be produced in man-made accelerators. Mechanism for acceleration, propagation and interaction of charged cosmic rays, high-energetic gamma rays and neutrinos are discussed in the context of the large astroparticle projects IceCube and CTA, which form a central part of DESY's activities in this field.

Presenter: MAIER, Gernot (Z_CTA (Cherenkov Telescope Array))

Track Classification: General Lectures

Contribution ID: **16**

Type: **not specified**

Astroparticle Physics 2

Friday 28 July 2023 11:30 (45 minutes)

Presenter: MAIER, Gernot (Z_CTA (Cherenkov Telescope Array))

Track Classification: General Lectures

Contribution ID: 17

Type: **not specified**

Particle Physics Theory 1

Monday 31 July 2023 10:30 (45 minutes)

We will discuss several basic topics in particle physics theory. It includes, for instance, Lagrangian mechanics, Lorentz transformation, dimensional analysis, beta decay, Fermi interaction, gauge theory, electroweak theory, chirality and helicity, spontaneous symmetry breaking, Higgs mechanism, etc.

Presenter: KIM, Hyungjin (T (Cosmology))

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: **18**

Type: **not specified**

Particle Physics Theory 2

Monday 31 July 2023 11:30 (45 minutes)

Presenter: KIM, Hyungjin (T (Cosmology))

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 19

Type: **not specified**

Particle Physics Detectors 1

Thursday 3 August 2023 09:30 (45 minutes)

In this lecture particle detectors will be introduced starting with a general introduction why and how. This will be followed by the introduction of interaction with matter, mostly concentrating on charged particles. Terms like ionization, Bethe Bloch multiple scattering and Bremsstrahlung will be introduced.

Once the basics are explained, one of the most important sub-detector type ? the calorimeter for the energy measurement will be introduced. Calorimeter concepts and used technologies plus some examples from ATLAS, Belle and CMS will be covered.

Presenter: GREGOR, Ingrid-Maria (DESY/Uni Bonn)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: **20**

Type: **not specified**

Particle Physics Detectors 2

Thursday 3 August 2023 10:30 (45 minutes)

Presenter: GREGOR, Ingrid-Maria (DESY/Uni Bonn)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: **21**

Type: **not specified**

Particle Physics Detectors 3

Thursday 3 August 2023 11:30 (45 minutes)

Presenter: GREGOR, Ingrid-Maria (DESY/Uni Bonn)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 22

Type: **not specified**

Quantum Chromo Dynamics 1

*Monday 7 August 2023 10:30 (45 minutes)***Abstract:**

Quantum Chromodynamics is the part of the Standard Model that describes the strong interactions between quarks and gluons, which bind to protons, neutrons, etc. The lectures will cover several aspects of this theory, with a focus on phenomena and methods relevant to collider physics. Where needed, some background from quantum field theory will be provided.

Topics covered:

- perturbation theory, running coupling and scale dependence
- QCD in electron-positron annihilation, hadronic jets
- from the parton model to the concept of factorisation
- QCD in Monte Carlo event generators
- parton distribution functions

Presenter: DIEHL, Markus (DESY)**Track Classification:** HEP: High Energy and Particle Physics Lectures

Contribution ID: 23

Type: **not specified**

Quantum Chromo Dynamics 2

Monday 7 August 2023 11:30 (45 minutes)

Presenter: DIEHL, Markus (DESY)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 24

Type: **not specified**

LHC Physics 1

Thursday 10 August 2023 10:30 (45 minutes)

In this set of lectures, we will provide an overview of the LHC physics program, focusing on selected results from the last years of operation. We will begin with a general introduction to Standard Model processes, explaining how data is collected at the LHC experiments, and introducing the key concepts required for data analysis. Following that, we will delve into more detailed discussions of results from Top quark and Higgs physics. Finally, we will conclude the series by presenting discussing results from searches for Beyond the Standard Model (BSM) physics and offering an outlook towards the future

Presenter: SEITZ, Claudia (DESY)**Track Classification:** HEP: High Energy and Particle Physics Lectures

Contribution ID: 25

Type: **not specified**

LHC Physics 2

Thursday 10 August 2023 11:30 (45 minutes)

Presenter: SEITZ, Claudia (DESY)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 26

Type: **not specified**

LHC Physics 3

Friday 11 August 2023 10:30 (45 minutes)

Presenter: SEITZ, Claudia (DESY)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 27

Type: **not specified**

LHC Physics 4

Friday 11 August 2023 11:30 (45 minutes)

Presenter: SEITZ, Claudia (DESY)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 28

Type: **not specified**

Plasma Wakefield Acceleration 1

Wednesday 16 August 2023 10:30 (45 minutes)

Plasmas sustain electric fields far in excess of GV/m. These fields can be utilized for the acceleration of charged particles to ultra-relativistic energies over distances several orders of magnitude shorter than in traditional acceleration schemes based on metallic radio-frequency cavities. Plasma-based electron accelerators rely on the excitation of strong plasma wakefields which can be, both, accelerating and linearly focussing. Such field configurations, in principle, enable the preservation of critical particle-beam properties such as their energy bandwidth and transverse phase-space density allowing for ultra-compact applications in photon science, health, and future particle-physics experiments. High-intensity lasers and high charge-density particle beams act as drivers in this scheme. Controlling their properties on femtosecond and micrometer scales and tailoring of the plasma source characteristics provides control over the microscopic acceleration scheme and has pushed plasma accelerator technology closer to application readiness and operational maturity. This lecture will introduce the basics of plasma wakefield acceleration, and review recent advances and highlights in the field achieved in the laser- and beam-driven plasma accelerator program at DESY (Hamburg, Germany), and put these results into the context of the pursued applications. This includes plasma accelerator R&D on the path to novel medical imaging modalities, compact injector systems, and high-efficiency energy-booster modules suitable for upgrades of existing and future facilities in photon science and particle physics.

Presenter: OSTERHOFF, Jens (DESY)**Track Classification:** General Lectures

Contribution ID: 29

Type: **not specified**

Plasma Wakefield Acceleration 2

Wednesday 16 August 2023 11:30 (45 minutes)

Presenter: OSTERHOFF, Jens (DESY)

Track Classification: General Lectures

Contribution ID: 30

Type: **not specified**

Future Colliders 1

Thursday 17 August 2023 10:30 (45 minutes)

The „next big thing“ in HEP colliders has still a long way to go. While the community agrees that the next energy-frontier collider should be a Higgs Factory, the path towards realisation, the form factor, or even the family of colliding particles has still to be decided. The path towards very high collision energies is even less clear and has a lot of technological challenges to pass. I will discuss the possible developments starting with HL-LHC towards the next circular (FCC, CEPC, Muons) or linear (ILC, CLIC) collider.

Presenter: Dr BUESSER, Karsten (DESY)**Track Classification:** HEP: High Energy and Particle Physics Lectures

Contribution ID: **31**

Type: **not specified**

Future Colliders 2

Thursday 17 August 2023 11:30 (45 minutes)

Presenter: Dr BUESSER, Karsten (DESY)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 32

Type: **not specified**

Particle Physics Detectors 4

Friday 4 August 2023 09:30 (45 minutes)

The second morning will start out with tracking detectors. What are they for and how does tracking work (very basic). The main technologies such as semiconductor and gas detectors will be shown including many examples from known experiments. Also Muon detectors as far outside tracking detectors will be covered.

In the last part of the lecture overall concepts, why are large detectors built the way they are, will be explained. The lecture is concluded with some examples from real life, also where something did go wrong with some reasons how it could happen.

Presenter: GREGOR, Ingrid-Maria (DESY/Uni Bonn)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 33

Type: **not specified**

Particle Physics Detectors 5

Friday 4 August 2023 10:30 (45 minutes)

Presenter: GREGOR, Ingrid-Maria (DESY/Uni Bonn)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: **34**

Type: **not specified**

Particle Physics Detectors 6

Friday 4 August 2023 11:30 (45 minutes)

Presenter: GREGOR, Ingrid-Maria (DESY/Uni Bonn)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 35

Type: **not specified**

Quantum Chromo Dynamics 3

Tuesday 8 August 2023 10:30 (45 minutes)

Presenter: DIEHL, Markus (DESY)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 36

Type: **not specified**

Quantum Chromo Dynamics 4

Tuesday 8 August 2023 11:30 (45 minutes)

Presenter: DIEHL, Markus (DESY)

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 37

Type: **not specified**

Particle Physics Theory 3

Wednesday 2 August 2023 10:30 (45 minutes)

Presenter: KIM, Hyungjin (T (Cosmology))

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: **38**

Type: **not specified**

Particle Physics Theory 4

Wednesday 2 August 2023 11:30 (45 minutes)

Presenter: KIM, Hyungjin (T (Cosmology))

Track Classification: HEP: High Energy and Particle Physics Lectures

Contribution ID: 39

Type: **not specified**

PS: Fundamentals of X-ray Matter Interaction 1

Tuesday 8 August 2023 10:00 (1h 45m)

Primary author: SON, Sang-Kil (CFEL-DESY)

Presenter: SON, Sang-Kil (CFEL-DESY)

Track Classification: PS: Photon Science Lectures

Contribution ID: 40

Type: **not specified**

PS: Fundamentals of X-ray Matter Interaction 2

Wednesday 9 August 2023 10:00 (1h 45m)

Primary author: SON, Sang-Kil (CFEL-DESY)

Presenter: SON, Sang-Kil (CFEL-DESY)

Track Classification: PS: Photon Science Lectures

Contribution ID: 41

Type: **not specified**

PS: Phenomena at High X-ray Intensity 1

Thursday 10 August 2023 10:29 (1h 45m)

Primary author: SANTRA, Robin (DESY & UHH)

Presenter: SANTRA, Robin (DESY & UHH)

Track Classification: PS: Photon Science Lectures

Contribution ID: 42

Type: **not specified**

PS: Phenomena at High X-ray Intensity 2

Friday 11 August 2023 10:29 (1h 45m)

Primary author: SANTRA, Robin (DESY & UHH)

Presenter: SANTRA, Robin (DESY & UHH)

Track Classification: PS: Photon Science Lectures

Contribution ID: 43

Type: **not specified**

PS: Reciprocal Space and Principles of Diffraction

Wednesday 26 July 2023 10:00 (1h 45m)

Primary author: YEFANOV, Oleksandr (FS-CFEL-1 (Forschung mit Photonen Experimente 1))

Presenter: YEFANOV, Oleksandr (FS-CFEL-1 (Forschung mit Photonen Experimente 1))

Track Classification: PS: Photon Science Lectures

Contribution ID: 44

Type: **not specified**

PS: Modern Crystallography: Processing Petabytes of Data

Monday 31 July 2023 10:00 (1h 45m)

Primary author: YEFANOV, Oleksandr (FS-CFEL-1 (Forschung mit Photonen Experimente 1))

Presenter: YEFANOV, Oleksandr (FS-CFEL-1 (Forschung mit Photonen Experimente 1))

Track Classification: PS: Photon Science Lectures

Contribution ID: 45

Type: **not specified**

PS: X-ray Spectroscopy of Quantum Materials

Tuesday 1 August 2023 10:00 (1h 45m)

Primary author: SCHOLZ, Markus (FS-FLASH (FLASH))

Presenter: SCHOLZ, Markus (FS-FLASH (FLASH))

Track Classification: PS: Photon Science Lectures

Contribution ID: 46

Type: **not specified**

PS: X-Ray Nano-Analytics and Microscopy 1

Thursday 17 August 2023 10:00 (1h 45m)

Primary author: SCHROER, Christian (FS-PETRA (PETRA III))

Presenter: SCHROER, Christian (FS-PETRA (PETRA III))

Track Classification: PS: Photon Science Lectures

Contribution ID: 47

Type: **not specified**

PS: X-Ray Nano-Analytics and Microscopy 2

Friday 18 August 2023 10:00 (1h 45m)

Primary author: SCHROER, Christian (FS-PETRA (PETRA III))

Presenter: SCHROER, Christian (FS-PETRA (PETRA III))

Track Classification: PS: Photon Science Lectures

Contribution ID: 48

Type: **not specified**

PS: Diagnostic of Light

Tuesday 15 August 2023 10:00 (1h 45m)

Primary author: FRUEHLING, Ulrike (FS-FLASH-O (FLASH Scientific User Operation))

Presenter: FRUEHLING, Ulrike (FS-FLASH-O (FLASH Scientific User Operation))

Track Classification: PS: Photon Science Lectures

Contribution ID: 49

Type: **not specified**

PS: Scattering Methods for Investigation of Sustainable Materials

Thursday 3 August 2023 10:00 (1h 45m)

Primary author: ROTH, Stephan (FS-SMA (Sustainable Materials))

Presenter: ROTH, Stephan (FS-SMA (Sustainable Materials))

Track Classification: PS: Photon Science Lectures

Contribution ID: **50**

Type: **not specified**

XFEL Tour

Monday 14 August 2023 10:00 (4 hours)

Track Classification: General Lectures

Contribution ID: 51

Type: **not specified**

PS: Introduction to ultrafast lasers and nonlinear optics

Thursday 17 August 2023 13:15 (1h 45m)

Primary author: ROSSI, Giulio Maria (FS-CFEL-2 (Ultrafast X-rays Group))

Presenter: ROSSI, Giulio Maria (FS-CFEL-2 (Ultrafast X-rays Group))

Track Classification: PS: Photon Science Lectures

Contribution ID: 52

Type: **not specified**

The PIER Graduate School presents itself to the DESY Summer Students

Friday 1 September 2023 14:00 (45 minutes)

Presenter: TEPASS, Stefanie (PIER (PIER))