CUI THE HAMBURG CENTRE FOR ULTRAFAST IMAGING

The Hamburg Centre for Ultrafast Imaging

The Graduate Days 2015

Hamburg
Campus Bahrenfeld
March 9 – 11

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

DESY

EMBL

MAX-PLANCK-GESELLSCHAFT

European XFEL

Programme

Monday, March 9, 2015

8:30 Registration (CFEL, Bld. 99, Foyer)

9:30 **Prof. Thomas Elsaesser**
Ultrafast phenomena in condensed matter systems
(ZOQ, Bld. 90, Seminar room, ground floor)

Prof. Arwen Pearson
Time resolved crystallography
(CFEL, Bld. 99, Seminar room I-II, ground floor)

Prof. Walter Kob
Soft matter and glass physics
(ILP, Bld. 69, Seminar room, ground floor)

11:00 Coffee Break (ZOQ, ILP, CFEL)

11:15 **Prof. Thomas Elsaesser**
Ultrafast phenomena in condensed matter systems
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Time resolved crystallography
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Soft matter and glass physics
(ILP, Bld. 69, Seminar room, ground floor)

12:30 Lunch (Desy-Canteen, Bld. 09)

14:00 **Prof. Rosario Fazio**
Strongly correlated systems in condensed matter and ultracold atoms
(ZOQ, Bld. 90, Seminar room, ground floor)

Dr. Rudolph Reimer
Electron microscopy
(CFEL, Bld. 99, Seminar room I-II, ground floor)

Prof. Ralf Röhlsberger
Ultrafast dynamics in nano-magnetic systems
(ILP, Bld. 69, Seminar room, ground floor)

15:30 Coffee Break (ZOQ, ILP, CFEL)

16:00 **Dr. Oliver Hein**
From Physics to Finance
(ZOQ, Bld. 90, Seminar room, ground floor)

Mr. Mike Kesselmeier
LabVIEW
(ILP, Bld. 69, Seminar room, ground floor)

Ms. Monica Schofield
Management of collaborative research projects / Project management
(CFEL, Bld. 99, Seminar room I-II-III, ground floor)

Mr. Rob Thompson
Objectives – Choices – Ideas.
(Setting goals, making decisions and stimulating creativity)
(CFEL, Bld. 99, Seminar room V – 01.109, first floor)

17:30 Free time

18:00 Special talk
Dr. Thomas Pattard
Editorial publishing policy and experiences of Physical Review and Physical Review Letters within the American Physical Society
(CFEL, Bld. 99, Seminar rooms I-II-III)

19:00 Welcome reception (CFEL, Bld. 99, Foyer)

Tuesday, March 10, 2015

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(ILP, Bld. 69, Seminar room, ground floor)

15:30 Coffee Break (ZOQ, ILP, CFEL)

16:00 **Dr. Tobias Sander**
Introduction to the Measurement and Management of Market Risk
(ZOQ, Bld. 90, Seminar room, ground floor)

Mr. Mike Kesselmeier
LabVIEW
(ILP, Bld. 69, Seminar room, ground floor)

Ms. Monica Schofield
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Objectives – Choices – Ideas.
(Setting goals, making decisions and stimulating creativity)
(CFEL, Bld. 99, Seminar room V – 01.109, first floor)

17:30 Free time

18:00 Colloquium
Prof. Atac Imamoglu
Cavity quantum electrodynamics with two-dimensional electron systems
(CFEL, Bld. 99, Seminar rooms I-II-III)

19:00 Reception (CFEL, Bld. 99, Foyer)

Wednesday, March 11, 2015

9:30 **Prof. Thomas Elsaesser**
Ultrafast phenomena in condensed matter systems
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Introduction to Credit Risk
(ZOQ, Bld. 90, Seminar room, ground floor)

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LabVIEW
(ILP, Bld. 69, Seminar room, ground floor)

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Management of collaborative research projects / Project management
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(Setting goals, making decisions and stimulating

creativity)
(CFEL, Bld. 99, Seminar room V – 01.109, first floor)

17:30 Free time

18:00 Industry event
Dr. Wolfgang Becken
Research in Optical Industry: Development Processes and Innovations generated by Rodenstock
(CFEL, Bld. 99, Seminar rooms I-II-III)

19:00 End of the Graduate Days of CUI

Abstracts

Morning long courses (Mon-Wed, 9:30-12:30)

Ultrafast phenomena in condensed matter systems: Prof. Thomas Elsaesser (Max-Born-Institute, Berlin, Germany)

This lecture combines an introduction in nonlinear light-matter interactions on ultrashort time scales with a discussion of recent results of ultrafast science. The following topics will be addressed:

- Nonlinear resonant and nonresonant light-matter interactions
- Generation of ultrashort pulses and experimental methods
- Ultrafast processes in liquids and biomolecular systems
- Nonlinear and quantum-coherent charge transport in solids in the terahertz frequency range
- Ultrafast structural dynamics of solids mapped by time-resolved x-ray methods.

While theoretical aspects will be discussed, the lecture mainly focuses on experimental results.

Time resolved crystallography: Prof. Arwen Pearson (Universität Hamburg, Germany)

The timescales of interest in biomolecular science span a wide range, from fast local reaction chemistry occurring on the femtosecond to nanosecond time scales, to the long range motions (changes in macromolecular conformation) over much slower timescales (tens of milliseconds to seconds). These often gate the reaction chemistry and link to biological responses such as signalling or complex assembly. Understanding biological mechanism thus requires understanding the coupling between structure, dynamics, chemistry and function over these time-scales as well as over a range of length scales from the molecular to the supramolecular and beyond. In this series of lectures we will look at the range of dynamic processes occuring in living organisms and discuss the biophysical tools that can be used to probe these, illustrated with a series of case studies. We will also discuss the peculiar challenges that arise in the application of physical and chemical anaytical tools to the study of biological soft matter.

Soft matter and glass physics: Prof. Walter Kob (University of Montpellier, France)

Soft matter refers to materials that are easily deformable at ambient temperatures since the interaction strength between the constituent particles are comparable with the thermal energy scale. Important examples are colloids, polymers, foams, gels, liquids crystals, as well as many biological systems, i.e. materials that are ubiquitous in our daily life (plastics, cosmetics, food, etc.). Since the particles of most soft materials have a non-trivial shape (polymers) or are not of strictly identical size (colloids), the material they form is usually not crystalline but amorphous, i.e. a glass. In order to understand these materials it is therefore necessary to understand the properties of viscous liquids and glassy materials, systems that from the point of view of theory are rather difficult to handle.

In these lectures I will first give an introduction to the physics of soft matter and how their properties can be characterized on the microscopic as well as the macroscopic level. I then will present the theoretical approaches that are used to describe these complex materials. Subsequently I will discuss the phenomenon of the glass transition and how it relates to the properties of soft materials as well as other type of glasses.

Afternoon short courses (Mon-Wed, 14:00-15:30)

Strongly correlated systems in condensed matter and ultracold atoms: Prof. Rosario Fazio (Scuola Normale Superiore di Pisa, Italy)

1) Phase diagram(s) of interacting bosons on a lattice
2) Non-equilibrium properties – adiabatic dynamics
3) Quantum quenches

In the first lecture I will introduce the basic models of strongly interacting systems on a lattice, I will discuss how they can be realised in optical lattice and (in the case of bosonic systems) their equilibrium phase diagram. In the second and third lectures I will move to non-equilibrium. In the second lecture I will discuss the so-called Kibble-Zurek mechanism when a system is dragged adiabatically through a critical point. I will conclude the third lecture by discussing how/when a system thermalises after a quantum quench.

Electron microscopy: Dr. Rudolph Reimer (Heinrich Pette Institute, Hamburg, Germany)

Electron microscopy (EM) is currently undergoing a revival. Recent developments in the fields of cryo EM and volume EM help to circumvent the obstacles of classical electron microscopy and open a complete new view on many current research topics. The lecture will

give an overview over the principles and historical developments in electron microscopy, the main problems of classical EM and modern solutions to them. Cryo-techniques and 3D EM will be discussed in detail. A strong focus will be put on the preparation of biological samples, with intent to keep them in a "lifelike" state. All topics will be illustrated with examples from recent research projects.

Ultrafast dynamics in nano-magnetic systems: Prof. Ralf Röhlsberger (Desy, Hamburg, Germany)

The manipulation of magnetic moments on nanoscale dimensions and ultrashort timescales has developed into a fascinating research topic in modern magnetism, not only due to its technological relevance for magnetic data storage and retrieval, but also for the understanding of the underlying principles of magnetization dynamics. This field is of particular importance nowadays when it comes to replace the electric charge by the magnetic spin as elementary carrier for information which could form the basis for a spin-based information technology of the future.

Time scales in magnetism reach from geological periods of the Earth's magnetic field reversal down to the femtosecond regime that is related to the exchange interaction between individual magnetic spins. The quest for increasingly faster speeds of information processing in magnetic media together with the intrinsic limitations that are connected with the generation of magnetic field pulses by electric currents have initiated intense searches for ways to control magnetization by other means than magnetic fields. Here the interaction of ultrashort pulses of light with magnetic materials is of paramount importance.

From the discovery of subpicosecond demagnetization over a decade ago to the recent demonstration of magnetization reversal by femtosecond laser pulses, the manipulation of magnetic order by ultrashort pulses of light has become a fundamentally challenging topic with a potentially high impact for future spintronics, data storage and manipulation, and quantum computation. Understanding the underlying mechanisms implies understanding the interaction of photons with charge-, spin-, and lattice degrees of freedom, as well as the exchange of angular momentum between them.

This lecture series will review the manipulation and investigation of magnetic order by electromagnetic waves in a systematic way, ranging from microwaves all the way up to hard x-rays as they are generated by synchrotron radiation sources and x-ray lasers.

Afternoon short courses (Mon-Wed, 16:00-17:30)

Physicists in risk finance: Dr. Oliver Hein, Dr. Tobias Sander, and Dr. Jochen Meyer (d-fine GmbH, Frankfurt, Germany)

First day: From Physics to Finance (Dr. Oliver Hein)

Finance has evolved into a highly complex subject affecting the whole economy. The understanding of the complex dynamics of financial products and markets is a strongly needed matter. Physicists are currently in the process of transferring physical ideas and paradigms into the economic context. The lecture outlines the ideas behind it and gives a broad overview of different models and approaches.

Second day: Introduction to the Measurement and Management of Market Risk (Dr. Tobias Sander)

Financial institutions are exposed to market risk whenever changes of market prices can impact their financial bottom line. For most banks prominent market risk drivers include interest and foreign exchange rates, commodity and equity prices, as well as credit spreads. This talk gives an introduction to the definition of market risk, the financial instruments it typically arises from, and statistical modelling approaches to quantitatively measure and control it.

Third day: Introduction to Credit Risk (Dr. Jochen Meyer)

Looking at the lending activities of financial institutions, credit risk is the most relevant risk to be managed. Although the field of credit risk modelling has evolved substantially during the last decade, there is still a lot of room for new approaches, basically because of a substantial change in the business environment and many new regulations. This talk gives an introduction to basic assumptions and the most common statistical models used in credit risk management.

LabVIEW: Mr. Mike Kesselmeier (National Instruments, Hamburg, Germany)

LabVIEW software is ideal for any measurement or control system. Also LabVIEW is the ideal development environment for innovation, discovery, and accelerated results.

In this lecture it will be explained what is LabVIEW and it will be shown how to programm with the graphical programming-language G.

The first part is especially for all LabVIEW-Rookies who never saw LabVIEW before.

In the second part it will be discussed how to control measurement devices like oscilloscopes. For example how can be used drivers or examples of the device

manufacturers. An other point will be the implementation of the VISA-API.

The last day will be focused on programming architectures like Queues/Notifiers and Case Structures.

Management of collaborative research projects / Project management: Ms. Monica Schofield (TuTech Innovation GmbH, Hamburg, Germany)

This workshop provides a hands-on introduction to the art of managing multi-disciplinary, multi-organisational research projects. Horizon 2020 is used as a model, but the approach is applicable to multi-partner projects. It is targeted at researchers and management support staff who may find themselves in a management role, but also those who perhaps just need to know about management involves. This workshop is also suitable as a complementary skills course in project management for young researchers. The workshop will follow the form of lectures followed by group exercises with discussion feedback. It aims to be very practical an interactive in nature, giving students skills and understanding that they themselves can apply rather than theory on project management.

The lectures will be given in English. Groups may discuss in German if preferred.

First session: A short introduction to the basics of project management

- Project management
- Role of the coordinator
- Basic management issues

Second session: Keeping control

- Project governance
- Effective communication
- Project controlling
- Managing multicultural teams

Third session: Dealing with conflicts and crises

- Root causes of project difficulties
- Handling conflicts
- Managing expectations and completion

Summary, conclusions, feedback Q&A.

Note that for this course the maximum number of participants is 20.

Objectives – Choices – Ideas. (Setting goals, making decisions and stimulating creativity): Mr. Rob Thompson (RTTA – Outstanding Interpersonal Skills for Research Scientists, Frankfurt, Germany)

A PhD is a huge undertaking and often the freedom that you are given can result in lack of direction rather than full motivation. Not having clear goals, being unable to decide how to progress while worrying that there is a better unexplored route will reduce anyone's motivation. Being able to set appropriate goals, make timely decisions and think outside the box are skills essential for the progression and achievement of your PhD.

Outcomes
In the 3 separate workshop sessions, participants will learn useful, easy-to-follow guidelines, which will enable them to:

1. Make effective use of their time by setting productive and realistic goals.
2. Be more efficient by being able to make appropriate and timely decisions.
3. Think creatively to be able to generate the innovative ideas needed to solve the new problems encountered.

These workshops will teach participants techniques to be more efficient and productive.

Workshop style
The workshops draws on the personal experience of all participants as well as that of the trainer, thereby ensuring that the training is specific for and relevant to the participants' individual needs. The workshop will be a structured discussion forum to facilitate ideas and develop strategies. The workshop will be very interactive. Expect to be asked lots of questions, expect to be challenged, expect to participate!

Note that for this course the maximum number of participants is 10.

Colloquium (Tue, 18:00)

Cavity quantum electrodynamics with two-dimensional electron systems: Prof. Atac Imamoglu (ETH Zürich, Switzerland)

Reversible coupling of excitons and photons in intrinsic semiconductor quantum wells embedded inside a microcavity has been used to study non-equilibrium condensation and superfluidity of cavity-polaritons. The attempts to use this system to observe polariton blockade on the other hand, has been hindered by the relatively weak electron-exchange dominated interaction that scales linearly with the exciton Bohr radius. I will present experiments on a high-mobility

two-dimensional electron gas (2DEG) simultaneously exhibiting strongly correlated phases and non perturbative coupling to a microcavity mode. Tuning the cavity into resonance with the electron gas when magnetic field $B_z = 0$ allows us to demonstrate a new dynamic regime of Fermi-edge physics where many-body excitations are delocalized trion~\~Fermi-edge polaritons. With $B_z \neq 0$, the cavity-polariton excitations show unique signatures of both integer and fractional quantum Hall states. The system is potentially of interest for realizing strongly correlated photonic systems since it may be possible to exploit strong electron density dependence of 2DEG-polariton splitting, or equivalently the trion Bohr radius, to enhance polariton-polariton interactions.

Practical information

Location

Campus Bahrenfeld
Notkestraße 85 (Main Entrance)/Luruper Chaussee 149 (Side Entrance)

- Center for Free Electron Laser Science (CFEL), Building 99
- Zentrum für Optische Quantentechnologien (ZOQ), Building 90
- Institut für Laserphysik (ILP), Building 69

Seminar room V (01.109) in CFEL is located on the first floor. The other rooms are located on the ground floor.

Contact

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22761 Hamburg
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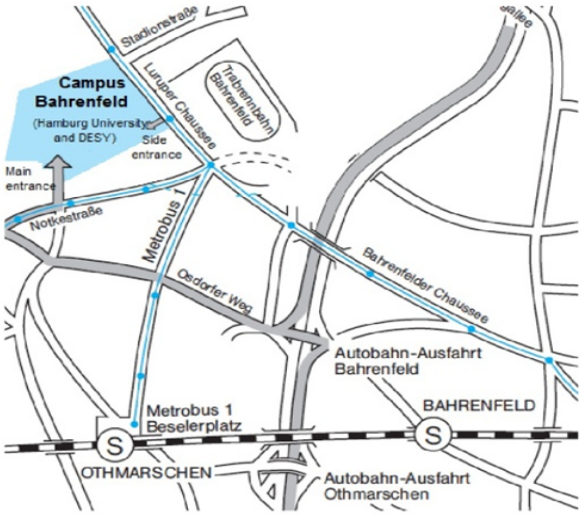
E-mail: anegrett@physnet.uni-hamburg.de

Directions



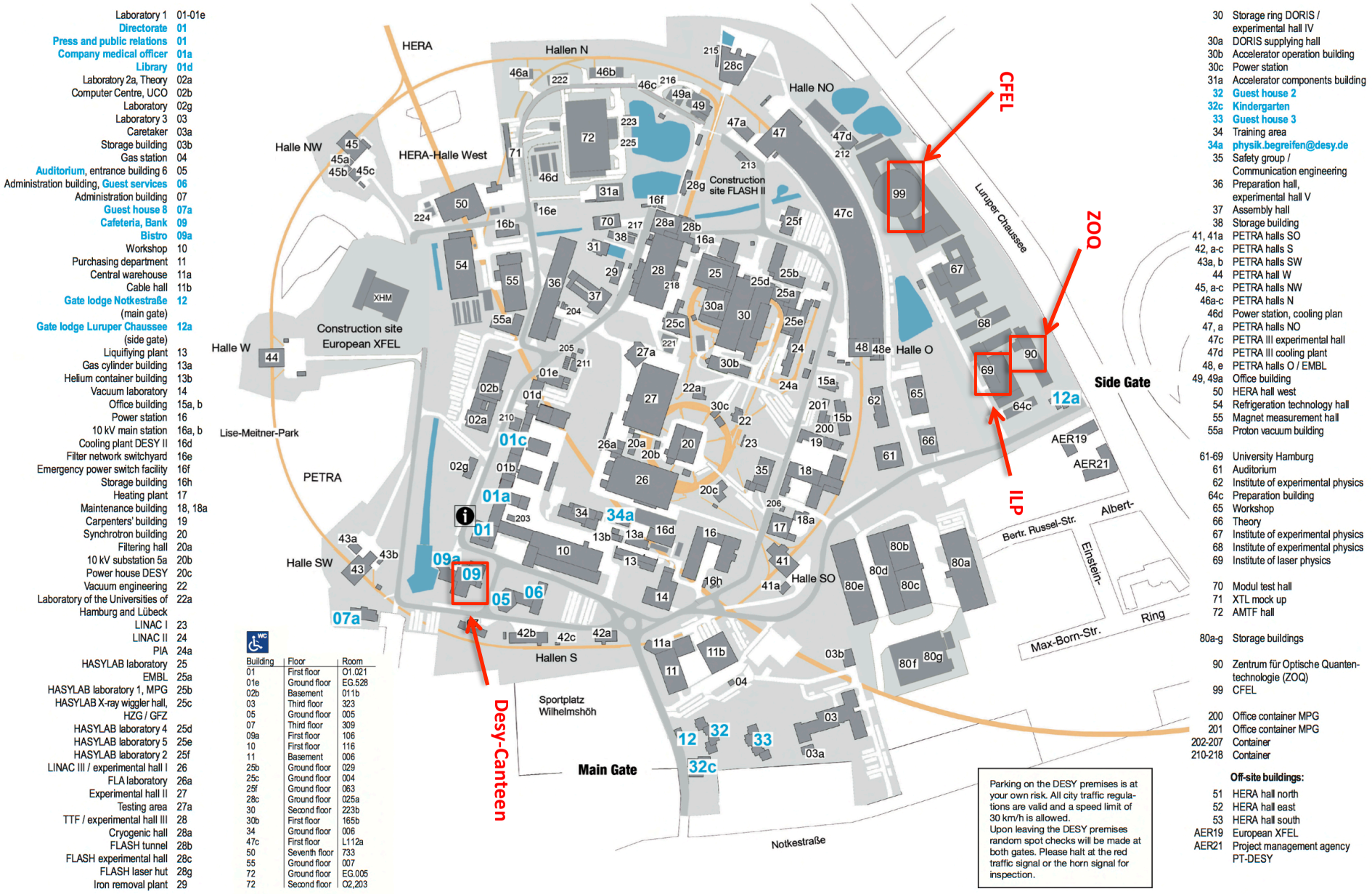
By train: to Hamburg-Altona station, then continue by taxi (travelling time about 15 minutes) or take a bus (see below).
By bus: To reach the side gate (recommended), take bus line 2 (direction Schenefeld Mitte) from Altona train station and get off at "Luruper Chaussee/DESY", travelling time about 20 minutes.
From train station "S-Bahn Othmarschen", take bus line 1 (direction "Schenefelder Holt") directly to the main entrance of the campus (bus stop "Zum Hünengrab/DESY"), travelling time about 25 minutes.
By plane: The campus can be reached from Hamburg airport by taxi in about 30 minutes. Alternatively, take suburban train S1 to Altona or Othmarschen (about 40 minutes, direct train) and a bus from there (see above).

Registration

The registration to the graduate days takes place on Monday March 9, 2015, in the foyer of the CFEL (Bld. 99) from 08:30 to 09:20. All registered participants and invited speakers will be provided with a badge and three meal vouchers.

Lunch and group photo

The common lunches will take place at the Desy-canteen (Bld. 09) from 12:45 to 14:00.
A group photo of all participants of the graduate days as well as of the invited speakers is scheduled for Tuesday March 10, 2015, at 12:40. All participants meet in the foyer of CFEL (Bld. 99).



Laboratory 1	01-01e
Directorate	**01**
Press and public relations	**01**
Company medical officer	**01a**
Library	**01d**
Laboratory 2a, Theory	02a
Computer Centre, UCO	02b
Laboratory	02g
Laboratory 3	03
Caretaker	03a
Storage building	03b
Gas station	04
Auditorium, entrance building 6	05
Administration building, **Guest services**	**06**
Administration building	07
Guest house 8	**07a**
Cafeteria, Bank	**09**
Bistro	**09a**
Workshop	10
Purchasing department	11
Central warehouse	11a
Cable hall	11b
Gate lodge Notkestraße (main gate)	**12**
Gate lodge Luruper Chaussee (side gate)	**12a**
Liquifying plant	13
Gas cylinder building	13a
Helium container building	13b
Vacuum laboratory	14
Office building	15a, b
Power station	16
10 kV main station	16a, b
Cooling plant DESY II	16d
Filter network switchyard	16e
Emergency power switch facility	16f
Storage building	16h
Heating plant	17
Maintenance building	18, 18a
Carpenters' building	19
Synchrotron building	20
Filtering hall	20a
10 kV substation 5a	20b
Power house DESY	20c
Vacuum engineering	22
Laboratory of the Universities of Hamburg and Lübeck	22a
LINAC I	23
LINAC II	24
PIA	24a
HASYLAB laboratory	25
EMBL	25a
HASYLAB laboratory 1, MPG	25b
HASYLAB X-ray wiggler hall, HZG / GFZ	25c
HASYLAB laboratory 4	25d
HASYLAB laboratory 5	25e
HASYLAB laboratory 2	25f
LINAC III / experimental hall I	26
FLA laboratory	26a
Experimental hall II	27
Testing area	27a
TTF / experimental hall III	28
Cryogenic hall	28a
FLASH tunnel	28b
FLASH experimental hall	28c
FLASH laser hut	28g
Iron removal plant	29

Building	Floor	Room
01	First floor	O1.021
01e	Ground floor	EG.528
02b	Basement	011b
03	Third floor	323
05	Ground floor	005
07	Third floor	309
09a	First floor	106
10	First floor	116
11	Basement	006
25b	Ground floor	029
25c	Ground floor	004
25f	Ground floor	063
28c	Ground floor	025a
30	Second floor	223b
30b	First floor	165b
34	Ground floor	006
47c	First floor	L112a
50	Seventh floor	733
55	Ground floor	007
72	Ground floor	EG.005
72	Second floor	O2,203

30	Storage ring DORIS / experimental hall IV
30a	DORIS supplying hall
30b	Accelerator operation building
30c	Power station
31a	Accelerator components building
32	**Guest house 2**
32c	**Kindergarten**
33	**Guest house 3**
34	Training area
34a	**physik.begreifen@desy.de**
35	Safety group / Communication engineering
36	Preparation hall, experimental hall V
37	Assembly hall
38	Storage building
41, 41a	PETRA halls SO
42, a-c	PETRA halls S
43a, b	PETRA halls SW
44	PETRA hall W
45, a-c	PETRA halls NW
46a-c	PETRA halls N
46d	Power station, cooling plan
47, a	PETRA halls NO
47c	PETRA III experimental hall
47d	PETRA III cooling plant
48, e	PETRA halls O / EMBL
49, 49a	Office building
50	HERA hall west
54	Refrigeration technology hall
55	Magnet measurement hall
55a	Proton vacuum building
61-69	University Hamburg
61	Auditorium
62	Institute of experimental physics
64c	Preparation building
65	Workshop
66	Theory
67	Institute of experimental physics
68	Institute of experimental physics
69	Institute of laser physics
70	Modul test hall
71	XTL mock up
72	AMTF hall
80a-g	Storage buildings
90	Zentrum für Optische Quantentechnologie (ZOQ)
99	CFEL
200	Office container MPG
201	Office container MPG
202-207	Container
210-218	Container

Off-site buildings:

51	HERA hall north
52	HERA hall east
53	HERA hall south
AER19	European XFEL
AER21	Project management agency PT-DESY

Parking on the DESY premises is at your own risk. All city traffic regulations are valid and a speed limit of 30 km/h is allowed.
Upon leaving the DESY premises random spot checks will be made at both gates. Please halt at the red traffic signal or the horn signal for inspection.

September 2012