

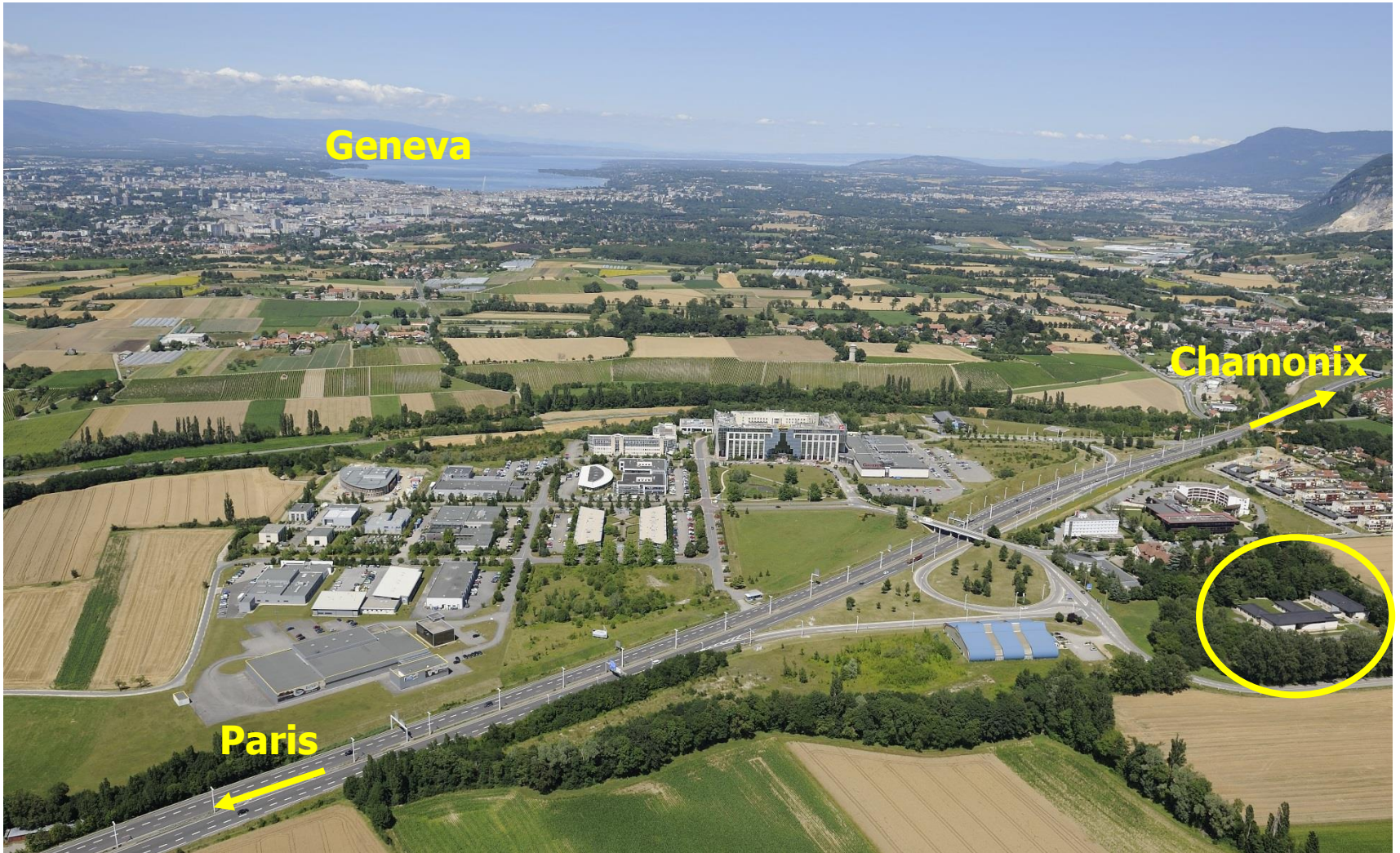
Welcome to JUAS 2020 Course 1

The science of particle accelerators

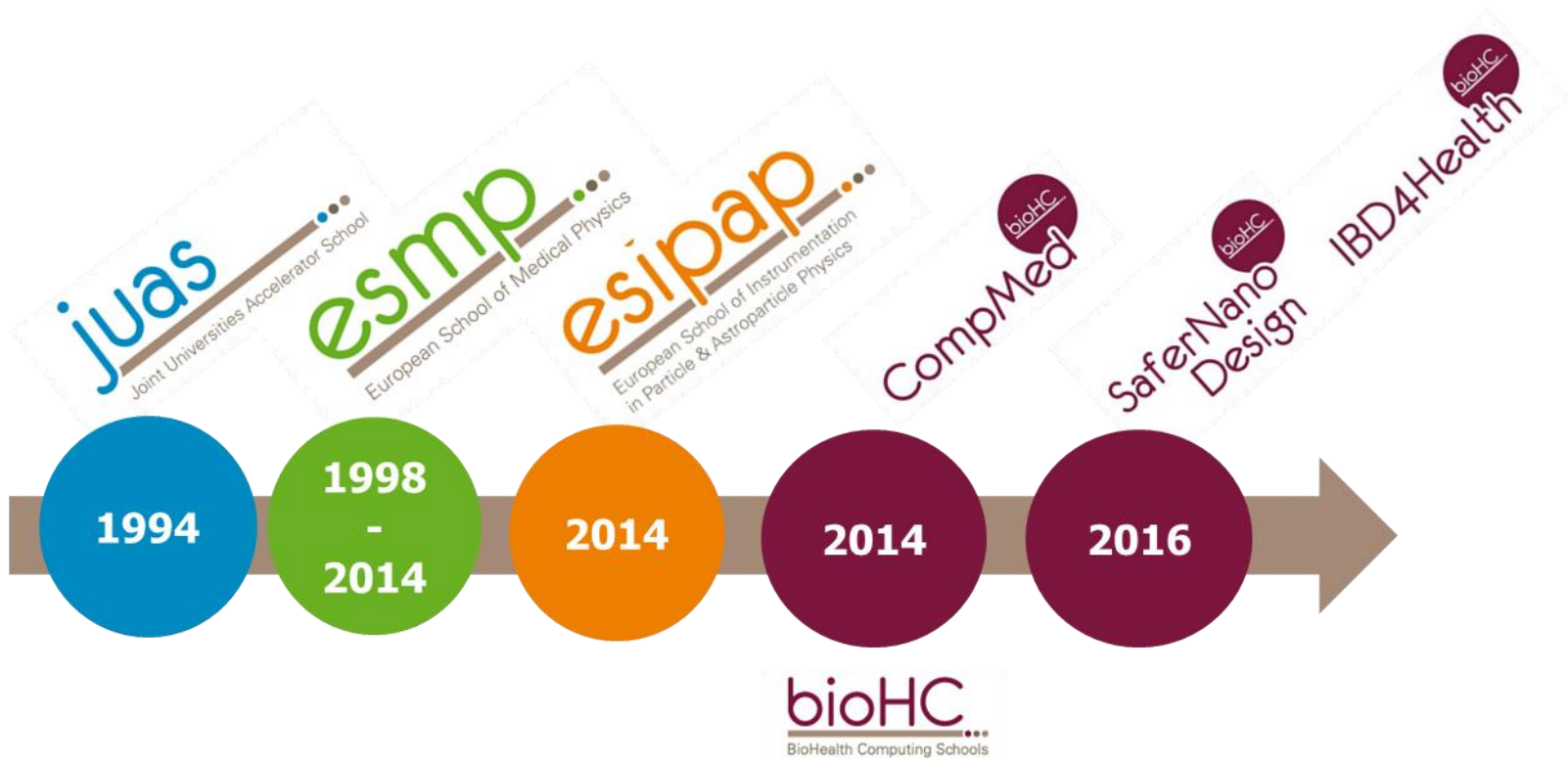
Philippe Lebrun
Director, JUAS

ESI Archamps Technopole
13 January 2020

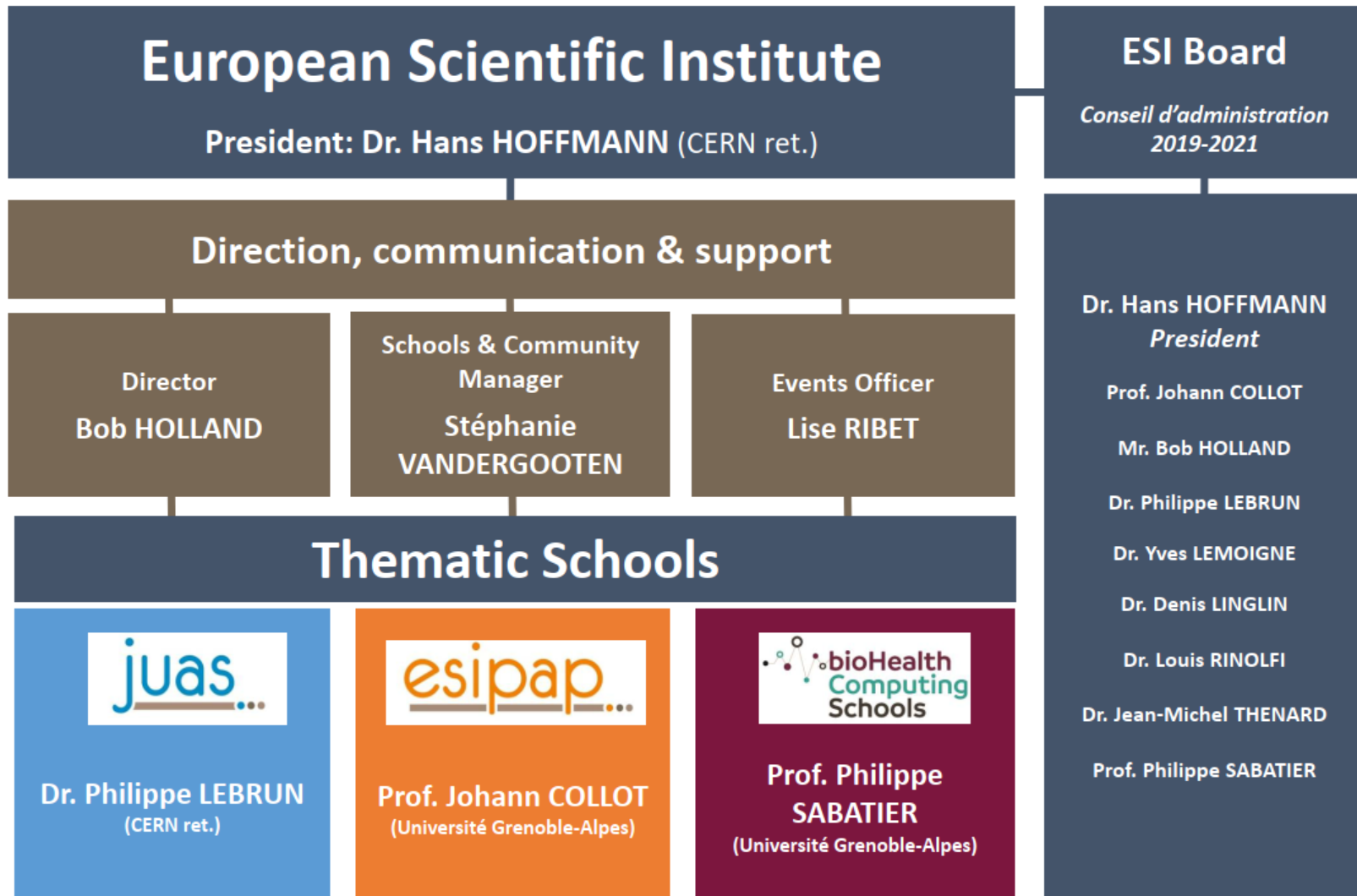
ESI Archamps Technopole, host of JUAS



ESI Scientific Schools



ESI Organization



JUAS mission

- Invented a century ago as instruments of basic science, particle accelerators have also become essential tools of applied science, engineering and medicine. There are today more than 40'000 particle accelerators in operation worldwide. Their design, construction and operation have developed into a specific domain of science and technology, resulting in a growing demand for training
- The mission of the Joint Universities Accelerator School (JUAS) is primarily to train graduate students from its Partner Universities in the science, technology and applications of particle accelerators
- For this purpose, JUAS holds two five-week courses yearly at the European Scientific Institute (ESI) in Archamps, taught by renowned experts from universities and laboratories and accredited by the Partner Universities:
 - A course on the Science of Particle Accelerators
 - A course on the Technology and Applications of Particle Accelerators
- Depending on the availability of places, JUAS also welcomes graduate students from other universities as well as professionals
- Additionally, JUAS contributes to knowledge dissemination and outreach in the field of particle accelerators

16 Partner Universities offer JUAS as an accredited component of a Master and/or Doctoral programme



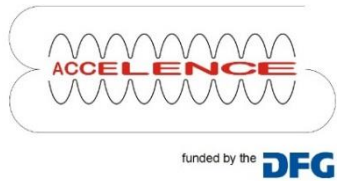
UiO : Universitetet i Oslo



Universität Rostock



JUAS is supported by 23 European research programmes, particle accelerator facilities, hospitals and private companies



A brief history of JUAS

- Origins (1994)
 - Accelerator courses given by CERN staff at Université Joseph Fourier in Grenoble
 - Creation of ESI by Département de la Haute-Savoie (France)
- Previous directors
 - M. Rey-Campagnolle (founder)
 - J. Le Duff
 - F. Méot
 - L. Rinolfi
- More than 1000 students trained
- JUAS alumni active in many accelerator laboratories worldwide
- We have celebrated the 25th session of JUAS in 2018, and the 25th anniversary of ESI in 2019

Welcome new Director designate

- JUAS 2020 will be my last session as Director of the school
- Dr. John Jowett has been appointed new Director designate, he is already with us and will be in charge from JUAS 2021 onwards



JUAS pedagogy

- Two courses, each 4 weeks + 1 week exams
 - *The science of particle accelerators*
 - *The technology and applications of particle accelerators*
- Expert lecturers from universities, national labs and CERN
- Lectures + tutorials + seminars + workshops + practical work + lab visits
- Syllabus and appointment of lecturers submitted to Advisory Board
- Lecture slides are available in INDICO prior to the lectures/tutorials
- No distribution of paper documents, except lecture write-ups when available
- Students are required to have a computer/tablet, get USB stick with memory space to download material
- «Refresher» lecture and tutorial documents available to students well before the course for personal work
- Written exams
- Oral presentations by students on design workshops and practical work

Prerequisites to JUAS Courses

- The JUAS courses are of graduate level (Master or Doctoral) and the students are expected to have knowledge of general physics at the Bachelor's level
- Prerequisites include elementary knowledge of
 - Special relativity
 - Electromagnetism
 - Nuclear physics
 - Mathematical methods of physics (vector analysis, vector spaces and matrices, differential & partial differential equations, Laplace & Fourier transforms)
 - Some knowledge of signal theory could also be useful
- Refresher courses and tutorials are provided in some of these matters, and must be studied before the JUAS courses start

JUAS - TIMETABLE 2020 - WEEK 1

Schedule 2020	Monday Jan 13	Tuesday Jan 14	Wednesday Jan 15	Thursday Jan 16	Friday Jan 17	
09:00		Relativity <i>H. Henke</i>	Electro-magnetism <i>H. Henke</i>	Intro. to Accelerator Design <i>Ph. Bryant</i>	Intro. to the Mini-Workshop <i>Ph. Bryant</i>	
10:00 10:15		Coffee Break	Coffee Break	Coffee Break	Coffee Break	
11:15		Relativity <i>H. Henke</i>	Electro-magnetism <i>H. Henke</i>	Intro. to Accelerator Design <i>Ph. Bryant</i>	Intro. to the Mini-Workshop <i>Ph. Bryant</i>	
12:15		12:00 OFFICIAL OPENING (welcome & building visit)	Relativity <i>H. Henke</i>	Electro-magnetism <i>H. Henke</i>	Intro. to Accelerator Design <i>Ph. Bryant</i>	Bus leaves at 11:15 from JUAS (Lunch at CERN, R3, offered by ESI)
		13:00 WELCOME LUNCH	BREAK	BREAK	BREAK	
14:00		14:00 Presentation of JUAS & Introduction of students <i>P. Lebrun</i>	Relativity <i>H. Henke</i>	Electro-magnetism <i>H. Henke</i>	Intro. to Accelerator Design <i>Ph. Bryant</i>	13:30 Visit of LHC Magnets Test Hall <i>M. Bajko</i>
15:00		History of particle accelerators Seminar <i>V. Vaccaro</i>	Particle optics <i>N. Biancacci</i>	Particle optics <i>N. Biancacci</i>	Intro. to Accelerator Design <i>Ph. Bryant</i>	15:00 Introduction to CERN & its Accelerator Network Seminar - <i>R. Alemany</i>
16:00 16:15		CHECK-IN AT THE RESIDENCE & SHOPPING FOR GROCERIES	Coffee Break	Coffee Break	Coffee Break	16:30 Visit of CERN Control Center <i>R. Alemany</i>
17:15			Particle optics <i>N. Biancacci</i>	Particle optics <i>N. Biancacci</i>	Intro. to Accelerator Design <i>Ph. Bryant</i>	Bus leaves at 17:30 from CERN
18:15			Particle optics <i>N. Biancacci</i>			
		AFTER WORK AT ESI				

JUAS - TIMETABLE 2020 - WEEK 2

Schedule 2020	Monday Jan 20	Tuesday Jan 21	Wednesday Jan 22	Thursday Jan 23	Friday Jan 24
09:00	Transverse Dynamics <i>A. Latina</i>	Transverse Dynamics <i>A. Latina</i>	Transverse Dynamics <i>A. Latina</i>	Cyclotrons <i>B. Jacquot</i>	Linacs <i>D. Alesini</i>
10:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:15	Transverse Dynamics <i>A. Latina</i>	Transverse Dynamics <i>A. Latina</i>	Transverse Dynamics <i>A. Latina</i>	Cyclotrons <i>B. Jacquot</i>	Linacs <i>D. Alesini</i>
11:15	Transverse Dynamics <i>A. Latina</i>	Transverse Dynamics <i>A. Latina</i>	Transverse Dynamics <i>A. Latina</i>	Cyclotrons <i>B. Jacquot</i>	Linacs <i>D. Alesini</i>
12:15	WORKING LUNCH	BREAK	BREAK	BREAK	BREAK
14:00	Intro. to MAD-X <i>G. Sterbini</i>	Transverse Dynamics <i>A. Latina</i>	Cyclotrons <i>B. Jacquot</i>	Linacs <i>D. Alesini</i>	Transverse Dynamics <i>A. Latina</i>
15:00	MADX <i>N. Fuster Martínez / H. Garcia Morales / A. Latina / G. Sterbini</i>	MADX <i>N. Fuster Martínez / H. Garcia Morales / A. Latina / G. Sterbini</i>	Cyclotrons <i>B. Jacquot</i>	Linacs <i>D. Alesini</i>	Transverse Dynamics <i>A. Latina</i>
16:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
16:15	MADX <i>N. Fuster Martínez / H. Garcia Morales / A. Latina / G. Sterbini</i>	MADX <i>N. Fuster Martínez / H. Garcia Morales / A. Latina / G. Sterbini</i>	Cyclotrons <i>B. Jacquot</i>	Linacs <i>D. Alesini</i>	MADX <i>N. Fuster Martínez / H. Garcia Morales / A. Latina / G. Sterbini</i>
17:15	Hybrid collisions in the LHC <i>J. Jowett</i>		European Projects for Collaborative Accelerator R&D Seminar <i>M. Vretenar</i>		MADX <i>N. Fuster Martínez / H. Garcia Morales / A. Latina / G. Sterbini</i>
18:15			AFTER WORK AT ESI		

JUAS - TIMETABLE 2020 - WEEK 3

Schedule 2020	Monday Jan 27	Tuesday Jan 28	Wednesday Jan 29	Thursday Jan 30	Friday Jan 31
09:00	Linear imperfections <i>H. Bartosik</i>	Synchrotron Radiation <i>R. Ischebeck</i>	Synchrotron Radiation <i>R. Ischebeck</i>	Synchrotron Radiation <i>R. Ischebeck</i>	Bus leaves at 07:00 from JUAS <i>(2 hours of travel by bus)</i> VISIT AT ESRF <i>J-L. Revol</i> <i>(Lunch offered by ESRF)</i>
10:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
10:15	Linear imperfections <i>H. Bartosik</i>	Synchrotron Radiation <i>R. Ischebeck</i>	Synchrotron Radiation <i>R. Ischebeck</i>	Synchrotron Radiation <i>R. Ischebeck</i>	
11:15	Linear imperfections <i>H. Bartosik</i>	Synchrotron Radiation <i>R. Ischebeck</i>	Synchrotron Radiation <i>R. Ischebeck</i>	Synchrotron Radiation <i>R. Ischebeck</i>	
12:15	WORKING LUNCH	BREAK	BREAK	BREAK	
14:00	Synchrotron Radiation <i>R. Ischebeck</i>	Linear imperfections <i>H. Bartosik</i>	Non-linear effects <i>H. Bartosik</i>	Non-linear effects <i>H. Bartosik</i>	14:00 - 16:00 Injection / Extraction <i>T. Perron</i>
15:00	Synchrotron Radiation <i>R. Ischebeck</i>	Linear imperfections <i>H. Bartosik</i>	Non-linear effects <i>H. Bartosik</i>	Non-linear effects <i>H. Bartosik</i>	
16:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Bus leaves at 17:00 from ESRF
16:15	Synchrotron Radiation <i>R. Ischebeck</i>	Linear imperfections <i>H. Bartosik</i>	Non-linear effects <i>H. Bartosik</i>	Non-linear effects <i>H. Bartosik</i>	
17:15		Free-Electron Lasers Seminar <i>(incl. ESIPAP students)</i> <i>E. Prat</i>		LHC & Future High-Energy Circular Collider Seminar <i>(incl. ESIPAP students)</i> <i>O. Bruning</i>	
18:15				AFTER WORK AT ESI	

JUAS - TIMETABLE 2020 - WEEK 4

Schedule 2020	Monday Feb 3	Tuesday Feb 4	Wednesday Feb 5	Thursday Feb 6	Friday Feb 7
09:00	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Space charge <i>M. Migliorati</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>
10:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:15	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Space charge <i>M. Migliorati</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>
11:15	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Space charge <i>M. Migliorati</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>
12:15	WORKING LUNCH	BREAK	BREAK	BREAK	BREAK
14:00	Space charge <i>M. Migliorati</i>	Space charge <i>M. Migliorati</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Presentation of Accelerator Design Students
15:00	Space charge <i>M. Migliorati</i>	Space charge <i>M. Migliorati</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Presentation of Accelerator Design Students
16:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
16:15	Space charge <i>M. Migliorati</i>	Space charge <i>M. Migliorati</i>	Longitudinal Dynamics <i>E. Métral/B. Salvant</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Presentation of Accelerator Design Students
17:15			Novel High Gradient Particle Accelerators Seminar <i>R. Assmann</i>	Future High-Energy Linear Colliders Seminar (incl. ESIPAP students) <i>J. Broff</i>	
18:15			AFTER WORK AT ESI		

JUAS - TIMETABLE 2020 - WEEK 5

Schedule 2020	Monday Feb 10	Tuesday Feb 11	Wednesday Feb 12	Thursday Feb 13	Friday Feb 14
09:00	Free for preparation of examinations	EXAMINATION Synchrotron Radiation <i>Written session</i>	EXAMINATION Transverse beam dynamics <i>Written session</i>	EXAMINATION Longitudinal beam dynamics <i>Written session</i>	
10:30		Coffee Break	Coffee Break	Coffee Break	
11:00		EXAMINATION Subject TBD <i>Written session</i>	EXAMINATION Subject TBD <i>Written session</i>	DISCUSSION SUMMARY OF JUAS LECTURES	
12:30		BREAK	BREAK	JUAS CLOSING COURSE 1 LUNCH OFFERED BY ESI	
14:00	Free for preparation of examinations				
15:00					
16:00					
16:15					
17:15					

JUAS 2019 Course 1 Examination

- Written examination
- 5 topics, each allocated one and a half hours
 - Transverse beam dynamics (coefficient 12)
 - Longitudinal beam dynamics (coefficient 12)
 - Synchrotron radiation (coefficient 12)
 - Remaining two topics (each coefficient 6) announced in week 4 (i.e. one week before examination)
- Students have access to paper documents and computer/tablet with USB stick
- WIFI and wire connections disabled in exam room
- No cell phone or connected electronic device allowed

Attendance Certificates & Grade Sheets Master and Doctoral students

- If not taking the exams, they get
 - **Certificate of Attendance** with mention «has opted not to take the examinations»
- If taking the exams, they get
 - **Certificate of Attendance** with
 - Overall grade of student
 - Overall class average grade & standard deviation
 - **Grade Sheet** with, for each subject
 - Student grade
 - Class average grade
- Class average grades are based only on results of Master and Doctoral students
- All grades out of 20

Attendance Certificates & Grade Sheets Professional students

- All students get
 - **Certificate of Attendance**, bearing no mention relative to examinations
- If taking the exams, they get additionally
 - **Grade Sheet** with, for each subject, the student grade
- Grades of Professional students are not included in class averages
- All grades out of 20

Evaluation of lectures and seminars by students

- The students are asked (anonymously) to evaluate the lectures and seminars, on the basis of several criteria:
 - Fulfilment of personal learning expectations
 - Quality of slides and written documents
 - Level of treatment of the subject
 - Quality of oral presentation
 - Guidance during lectures and tutorials
- The students are also asked for possible improvements to the course
- Evaluation is done on-line using Google Forms
- Evaluation results are communicated
 - Individually to the lecturers
 - Statistically to the JUAS Advisory Board

Possibility of practical work on the SOLEIL synchrotron

- The SOLEIL Synchrotron in Saclay, offers the possibility to **two JUAS students** to take part in a Machine Development (MD) session at their premises
- This requires some preparation work and the writing of a short report
- The date of the MD is **Monday 10 February morning**
 - In view of the early start, the students will travel to Paris on Sunday 9 February, spend the night in Saclay and return on Monday evening
 - Transport will be arranged and paid by ESI
 - Accommodation will be arranged and paid by SOLEIL
- **Candidates should declare their interest to participate by Monday 20 January to the JUAS director**
- The selection of students will be made by the JUAS director

IPAC Prize for JUAS Student

- A JUAS student is allotted a prize by the IPAC Committee for **attending the IPAC conference**
- The proposal is made by the JUAS director to the IPAC Conference Coordinator, based on the following **criteria**
 - To obtain the best mark at the examination of Course 1
 - To continue his/her career in the field of particle accelerators
 - To present his/her work at the Conference
 - To serve as required at the Conference (e.g. scientific secretary of session, man the JUAS booth,...)



10 > 15
MAY 2020

11th
INTERNATIONAL
PARTICLE
ACCELERATOR
CONFERENCE

REGISTRATION & ABSTRACT
SUBMISSION OPENS
SEPTEMBER 2019

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IPAC20

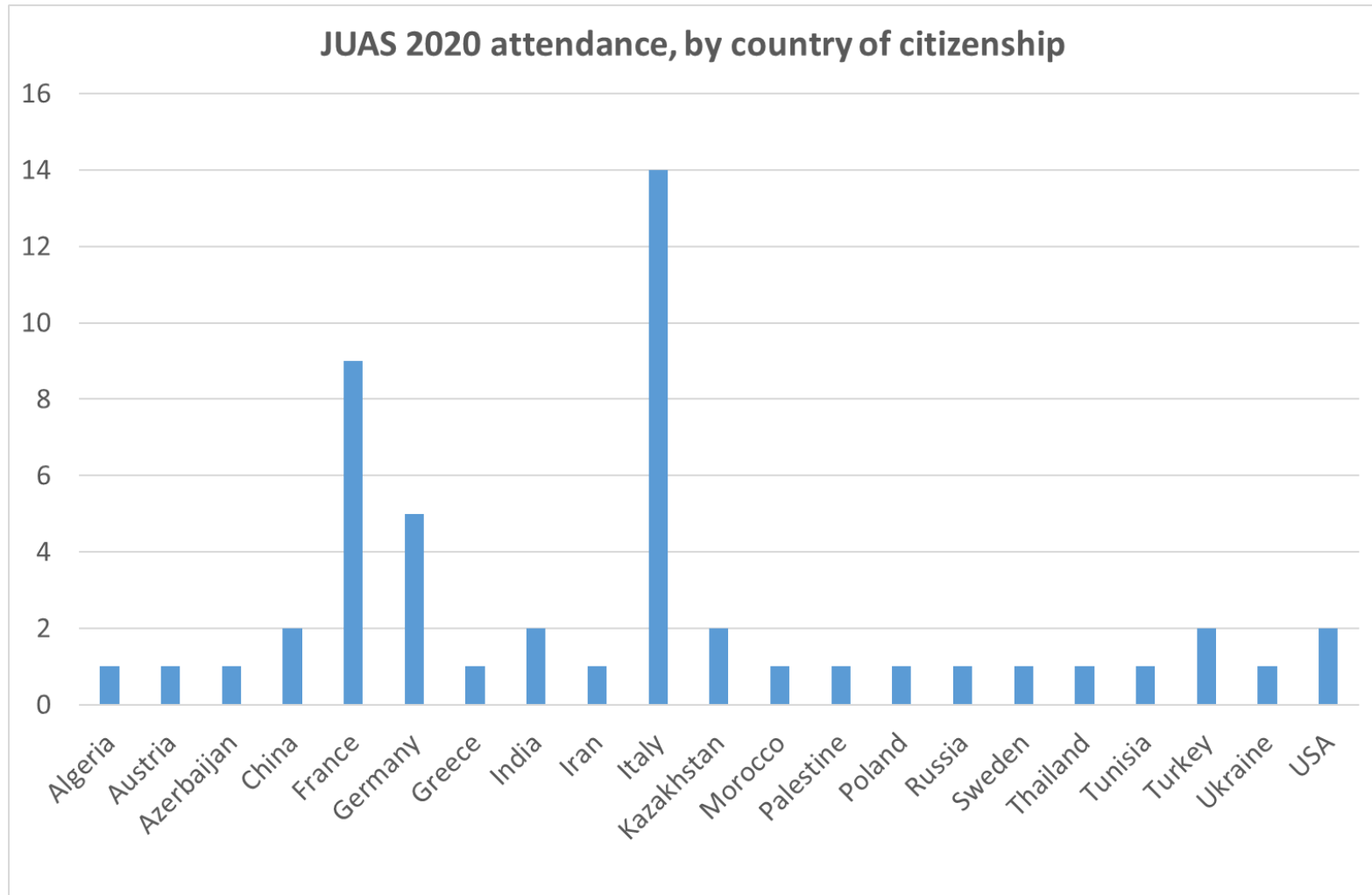
> Organizing Committee Chair
Mike SEIDEL, PSI, Switzerland

> Scientific Programme Committee Chair
Ralph ASSMANN, DESY, Germany

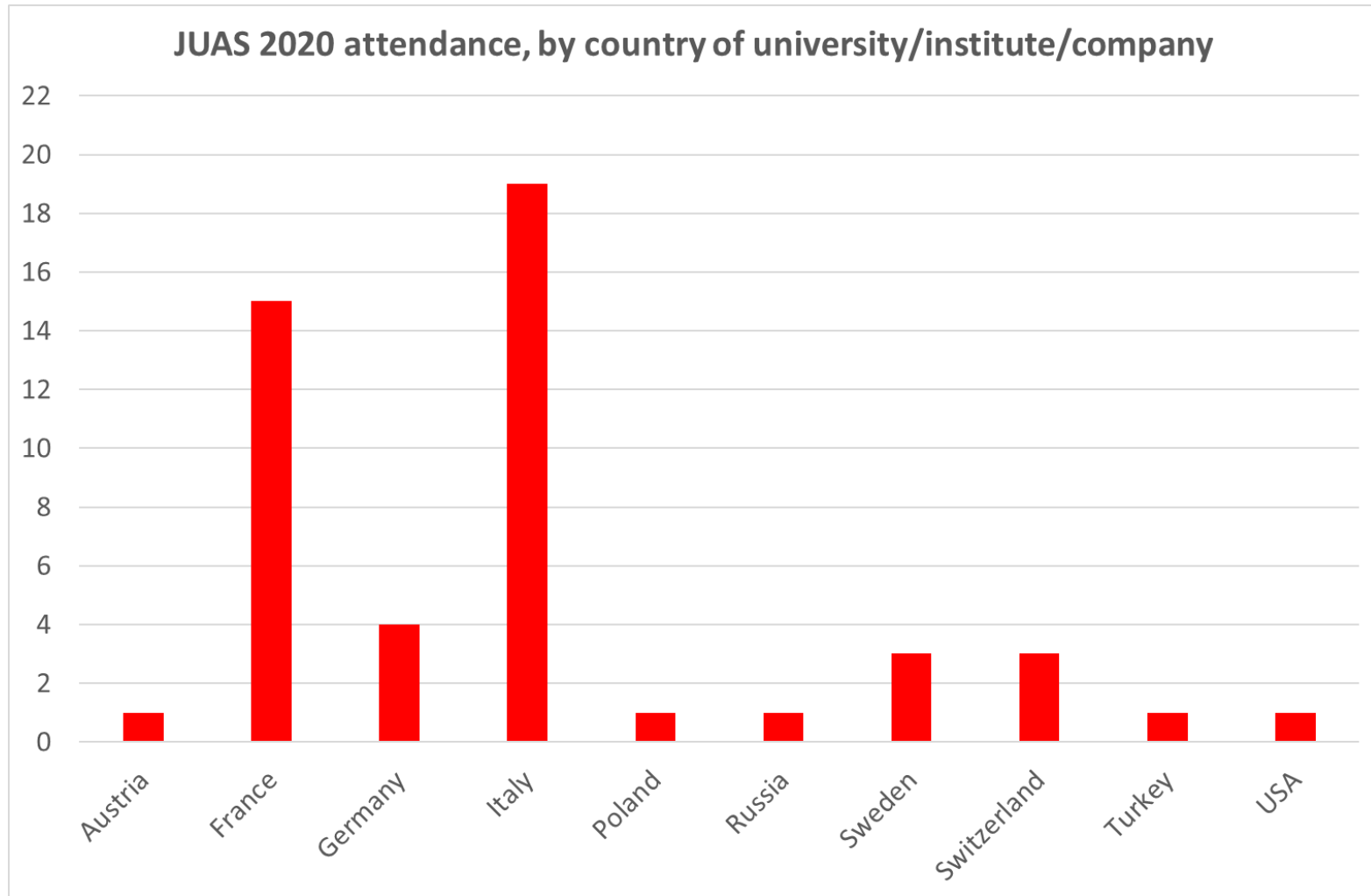
> Local Organizing Committee Chair
Frédéric CHAUTARD, GANIL, France

The poster features a background image of the Mont-Saint-Etienne castle in Caen, France, reflected in water. The design is split diagonally into blue and purple sections.

Origin of JUAS 2020 students



Origin of JUAS 2020 students



JUAS code of conduct [1/2]

- **Mutual respect**

- Freedom of opinion and of belief
- Cultural diversity
- Gender equality

⇒ Constitution of France, Article 1

- *La France... assure l'égalité devant la loi sans distinction d'origine, de race ou de religion. Elle respecte toutes les croyances*
- *France... shall ensure the equality before the law, without distinction of origin, race or religion. It shall respect all beliefs*

- **No dress code, but**

⇒ Loi du 11 octobre 2010 interdisant la dissimulation du visage dans l'espace public

- *Nul ne peut, dans l'espace public, porter une tenue destinée à dissimuler son visage*
- *Nobody may, in public space, wear a dress hiding his/her face*

JUAS code of conduct [2/2]

- **Behaviour**

- **Arrive on time** at the lectures
- **Individual and collective behaviour**, in particular during visits, must not impair the good reputation of JUAS... but rather improve it further!

- **Examinations**

- Respect the ban on cell phones and connected electronic devices
- Cheating will result in immediate exclusion

Job opportunities

- Studying at JUAS is a good opportunity to find a position
 - Internship in national or international laboratory
 - Summer job
 - PhD grant
 - Post doctoral
 - ...
- Do not hesitate to
 - Talk to the lecturers during coffee and lunch breaks
 - Talk to the people you will meet during laboratory visits

- Consult our updated job opportunity web site

<http://www.esi-archamps.eu/Thematic-Schools/JUAS/Job-opportunities>

Internship in Accelerator Physics at CERN January 2020

- Proposal for an internship (up to 6 months) on either of two subjects
 - Modelling longitudinal space charge in the PS
 - Beam measurements of PS resistive impedance
- <https://jobs.smartrecruiters.com/CERN/743999697435739-short-term-internship-2020>
- Contact Alexandre Lasheen alexandre.lasheen@cern.ch

Developing the JUAS network

- CV Yearbook
 - We publish a CV (curriculum vitae) Yearbook
 - Introducing JUAS,
 - Containing the curriculum vitae of each JUAS 2020 student (with his/her agreement)
 - Distributed to our partner universities and industrial sponsors
- Alumni network
 - Build up the JUAS Alumni network using social media
- More information will be communicated to you on these matters during the Course

Have a pleasant and fruitful time at JUAS!

