

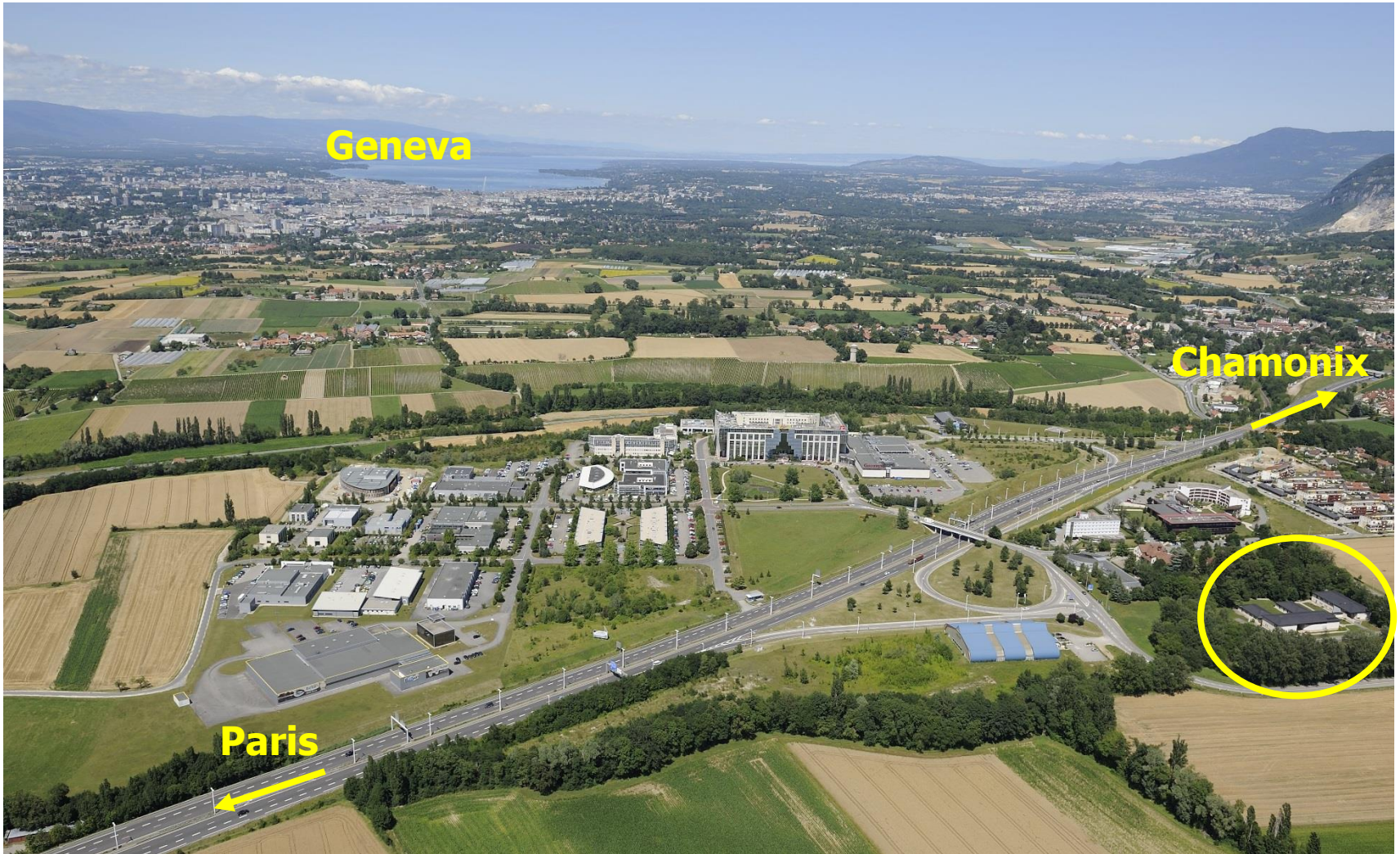
Welcome to JUAS 2018 Course 1

The science of particle accelerators

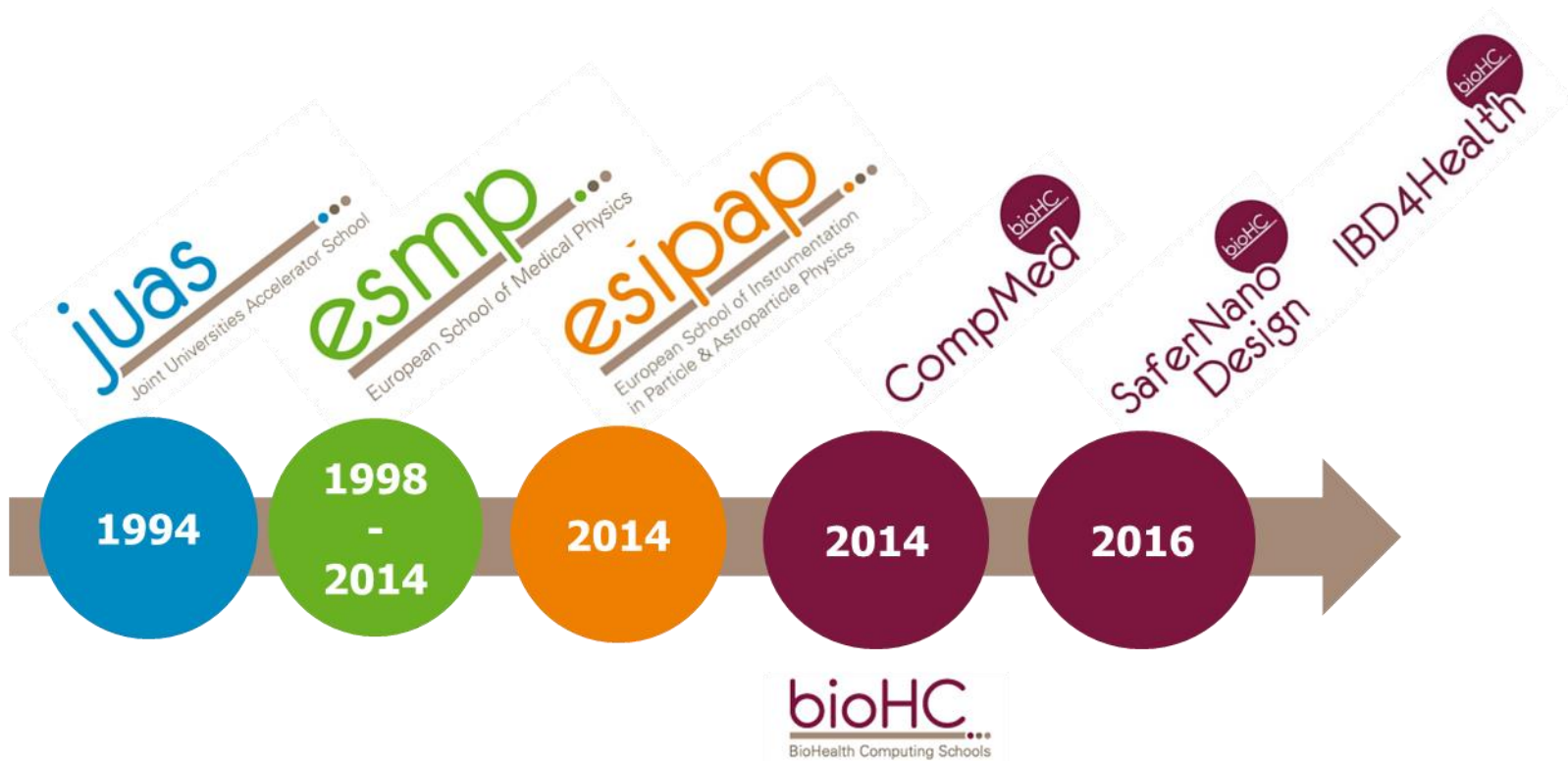
Philippe Lebrun
Director, JUAS

ESI Archamps Technopole
8 January 2018

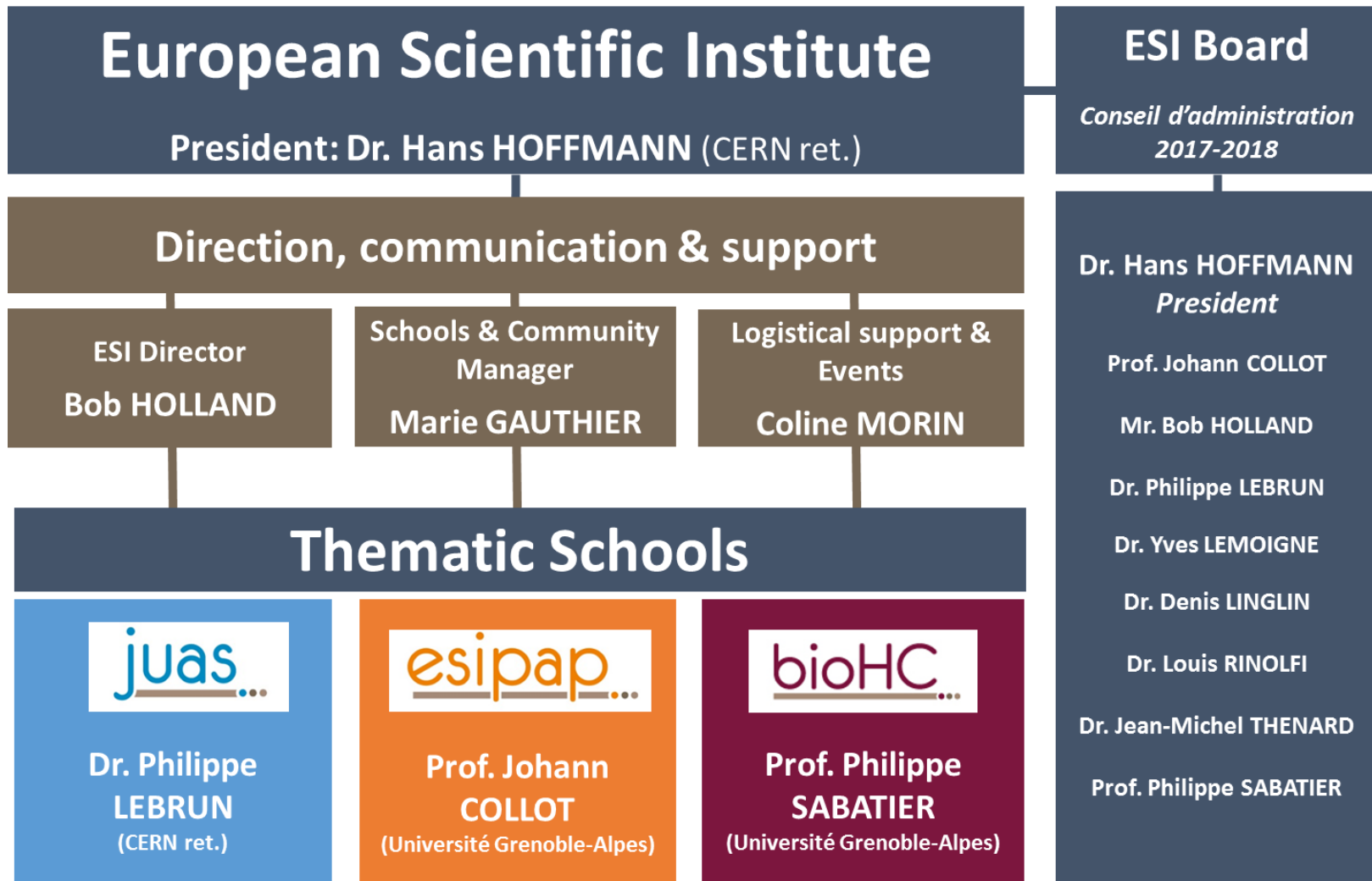
ESI Archamps Technopole, host of JUAS



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 30'000 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

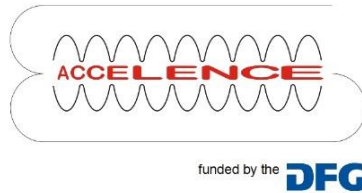
16 Partner Universities



UiO : Universitetet i Oslo



22 Sponsor institutes, industries & European programs



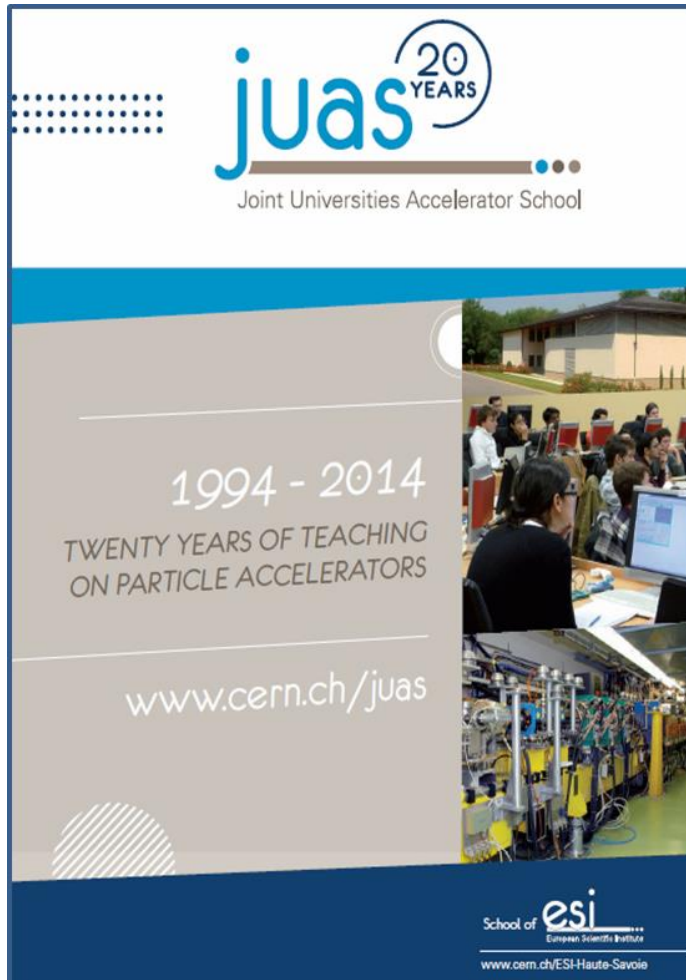
Elettra Sincrotrone Trieste



Science & Technology Facilities Council



January-March 2018, the 25th session of JUAS



- **Origins**
 - 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 in 24 sessions of JUAS since 1994
- We'll celebrate the 25th session on 15 February

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 notes available
 - On INDICO at beginning of course
 - On paper (color printing) for the lectures
- «Refresher» lecture and tutorial documents (E-M, Relativity, Intro to RF, Intro to Magnets) available to students well before the course for personal work
- Written exams
- Oral presentations by students on design workshops and practical work

JUAS - TIMETABLE 2018 - WEEK 1

Schedule 2018	Monday Jan 8 th	Tuesday Jan 9 th	Wednesday Jan 10 th	Thursday Jan 11 th	Friday Jan 12 th
09:00		Relativity lecture <i>H. Henke</i>	Electro-magnetism lecture <i>H. Henke</i>	European Projects for Collaborative Accelerator R&D <i>M. Vretenar</i>	Intro. to the Mini-Workshop lecture <i>Ph. Bryant</i>
10:00		Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:15		Relativity tutorial <i>H. Henke</i>	Electro-magnetism lecture <i>H. Henke</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>	Intro. to the Mini-Workshop lecture <i>Ph. Bryant</i>
11:15		Relativity lecture <i>H. Henke</i>	Electro-magnetism tutorial <i>H. Henke</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>	Bus leaves at 11:15 from JUAS (Lunch at CERN, R1, offered by ESI)
12:15	12:00 OFFICIAL OPENING (welcome & building visit)				
	13:00 WELCOME LUNCH	BREAK	BREAK	BREAK	13:00 Visit of LHC Magnets Test Hall
14:00	14:00 Presentation of JUAS & Presentation of students <i>P. Lebrun</i>	Relativity lecture <i>H. Henke</i>	Electro-magnetism lecture <i>H. Henke</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>	Introduction to CERN Seminar - Ph. Lebrun
15:00	Particle accelerators, instruments of discovery in physics Seminar <i>P. Lebrun</i>	Particle optics lecture <i>J.M. De Conto</i>	Particle optics tutorial <i>J.M. De Conto</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>	CERN Accelerator Network Seminar - R. Alemany
16:00	CHECK-IN AT THE RESIDENCE & SHOPPING FOR GROCERIES	Coffee Break	Coffee Break	Coffee Break	Visit at CERN Control Center
16:15		Particle optics lecture <i>J.M. De Conto</i>	Particle optics tutorial <i>J.M. De Conto</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>	
17:15		Particle optics lecture <i>J.M. De Conto</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>		
18:15					Bus leaves at 17:00 from CERN

JUAS - TIMETABLE 2018 - WEEK 2

Schedule 2018	Monday Jan 15 th	Tuesday Jan 16 th	Wednesday Jan 17 th	Thursday Jan 18 th	Friday Jan 19 th
09:00	<p><i>Bus leaves at 07:30 from JUAS</i></p> <p><i>(2 hours of travel by bus)</i></p> <p>VISIT AT ESRF</p> <p><i>(Lunch offered by ESRF)</i></p>	Transverse Dynamics lecture <i>A. Latina</i>	Transverse Dynamics lecture <i>A. Latina</i>	Transverse Dynamics lecture <i>A. Latina</i>	Cyclotrons lecture <i>B. Jacquot</i>
10:00		Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:15		Transverse Dynamics lecture <i>A. Latina</i>	Transverse Dynamics lecture <i>A. Latina</i>	Transverse Dynamics lecture <i>A. Latina</i>	Cyclotrons lecture <i>B. Jacquot</i>
11:15		Transverse Dynamics tutorial <i>A. Latina</i>	Transverse Dynamics tutorial <i>A. Latina</i>	Transverse Dynamics tutorial <i>A. Latina</i>	Cyclotrons tutorial <i>B. Jacquot</i>
12:15		BREAK	BREAK	BREAK	BREAK
14:00	<p>14:00 - 16:00 Injection / Extraction lecture <i>Thomas Perron</i></p>	Intro. to MADX <i>G. Sterbini</i>	Transverse Dynamics lecture <i>A. Latina</i>	Cyclotrons lecture <i>B. Jacquot</i>	Transverse Dynamics lecture <i>A. Latina</i>
15:00		MADX <i>N. Fuster Martinez / H. Garcia Morales / A. Latina / G. Sterbini</i>	MADX <i>N. Fuster Martinez / H. Garcia Morales / A. Latina / G. Sterbini</i>	Cyclotrons tutorial <i>B. Jacquot</i>	Transverse Dynamics lecture <i>A. Latina</i>
16:00	<p><i>Bus leaves at 17:00 from ESRF</i></p>	Coffee Break	Coffee Break	Coffee Break	Coffee Break
16:15		MADX <i>N. Fuster Martinez / H. Garcia Morales / A. Latina / G. Sterbini</i>	MADX <i>N. Fuster Martinez / H. Garcia Morales / A. Latina / G. Sterbini</i>	Cyclotrons lecture <i>B. Jacquot</i>	MADX <i>N. Fuster Martinez / H. Garcia Morales / A. Latina / G. Sterbini</i>
17:15			LHC & Future High-Energy Circular Collider Seminar <i>F. Bordry</i>		MADX <i>N. Fuster Martinez / H. Garcia Morales / A. Latina / G. Sterbini</i>
18:15			AFTER WORK AT ESI		

JUAS - TIMETABLE 2018 - WEEK 3

Schedule 2018	Monday Jan 22 nd	Tuesday Jan 23 rd	Wednesday Jan 24 th	Thursday Jan 25 th	Friday Jan 26 th
09:00	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Linear imperfections lecture <i>H. Bartosik</i>
10:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:15	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Linear imperfections lecture <i>H. Bartosik</i>
11:15	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral/B. Salvant</i>	Non-linear effects lecture <i>H. Bartosik</i>
12:15	WORKING LUNCH	BREAK	BREAK	BREAK	BREAK
14:00	Linear imperfections lecture <i>H. Bartosik</i>	Linear imperfections lecture <i>H. Bartosik</i>	Linacs lecture <i>J-B. Lallement</i>	Linacs tutorial <i>J-B. Lallement</i>	Non-linear effects lecture <i>H. Bartosik</i>
15:00	Linear imperfections lecture <i>H. Bartosik</i>	Linear imperfections lecture <i>H. Bartosik</i>	Linacs lecture <i>J-B. Lallement</i>	Linacs tutorial <i>J-B. Lallement</i>	Non-linear effects lecture <i>H. Bartosik</i>
16:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
16:15	The neutrino physics programme <i>Alain Blondel</i> CERN & U. of Geneva	Free-Electron Lasers Seminar <i>E. Prat</i>	Linacs lecture <i>J-B. Lallement</i>	Linacs tutorial <i>J-B. Lallement</i>	Non-linear effects lecture <i>H. Bartosik</i>
17:15					

JUAS - TIMETABLE 2018 - WEEK 4

Schedule 2018	Monday Jan 29 th	Tuesday Jan 30 th	Wednesday Jan 31 st	Thursday Feb 1 st	Friday Feb 2 nd
09:00	Synchrotron Radiation lecture <i>R. Bartolini</i>	Synchrotron Radiation lecture <i>R. Bartolini</i>	Space charge lecture <i>M. Migliorati</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Instabilities lecture <i>M. Migliorati</i>
10:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:15	Synchrotron Radiation lecture <i>R. Bartolini</i>	Synchrotron Radiation lecture <i>R. Bartolini</i>	Space charge lecture <i>M. Migliorati</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Instabilities lecture <i>M. Migliorati</i>
11:15	Synchrotron Radiation tutorial <i>R. Bartolini</i>	Synchrotron Radiation tutorial <i>R. Bartolini</i>	Space charge lecture <i>M. Migliorati</i>	Mini-workshop Accelerator Design <i>Ph. Bryant</i>	Instabilities lecture <i>M. Migliorati</i>
12:15	WORKING LUNCH	BREAK	BREAK	BREAK	BREAK
14:00	Synchrotron Radiation lecture <i>R. Bartolini</i>	Synchrotron Radiation lecture <i>R. Bartolini</i>	Space charge lecture <i>M. Migliorati</i>	Mini-workshop Accelerator Design <i>R. Bartolini</i>	Presentation of Accelerator Design <i>Students</i>
15:00	Synchrotron Radiation lecture <i>R. Bartolini</i>	Synchrotron Radiation lecture <i>R. Bartolini</i>	Space charge lecture <i>M. Migliorati</i>	Mini-workshop Accelerator Design <i>R. Bartolini</i>	
16:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
16:15	Synchrotron Radiation lecture <i>R. Bartolini</i>	Synchrotron Radiation tutorial <i>R. Bartolini</i>	Novel High Gradient Particle Accelerators Seminar <i>R. Assmann</i>	Mini-workshop Accelerator Design <i>R. Bartolini</i>	Presentation of Accelerator Design
17:15	Future High-Energy Linear Colliders Seminar <i>L. Rinolfi</i>			AFTER WORK AT ESI	
18:15					

JUAS - TIMETABLE 2018 - WEEK 5

Schedule 2018	Monday Feb 5 th	Tuesday Feb 6 th	Wednesday Feb 7 th	Thursday Feb 8 th	Friday Feb 9 th
09:00	Free for preparation of examinations	EXAMINATION Synchrotron Radiation <i>Written session</i>	EXAMINATION Longitudinal beam dynamics <i>Written session</i>	EXAMINATION Transverse beam dynamics <i>Written session</i>	
10:30		Coffee Break	Coffee Break	Coffee Break	
11:00		EXAMINATION topic to be announced <i>Written session</i>	EXAMINATION topic to be announced <i>Written session</i>	DISCUSSION SUMMARY OF JUAS LECTURES	
12:30		WORKING LUNCH	BREAK	BREAK	
14:00	Free for preparation of examinations				
15:00					
16:00 16:15					
17:15					

JUAS 2017 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)
- Permitted for exam: all written documents, pocket calculator
- Forbidden for exam: connected electronic devices

JUAS Student Certification

- JUAS and home institutions of students
 - Master Students: Partner University may give ECTS credits to their students who have passed the examination for each Course
 - Doctoral Students: credits may be given by the doctoral schools according to their own policy
 - Professionals: JUAS Course may be considered part of professional training («Formation Continue» in France)
- Certification
 - JUAS issues a Certificate for each Course containing all information
 - Subjects studied and numbers of hours
 - Exam taken or not
 - Marks obtained in relation to class averages
 - Student ranking

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

NEW

Possibility of practical work on the ESRF accelerator

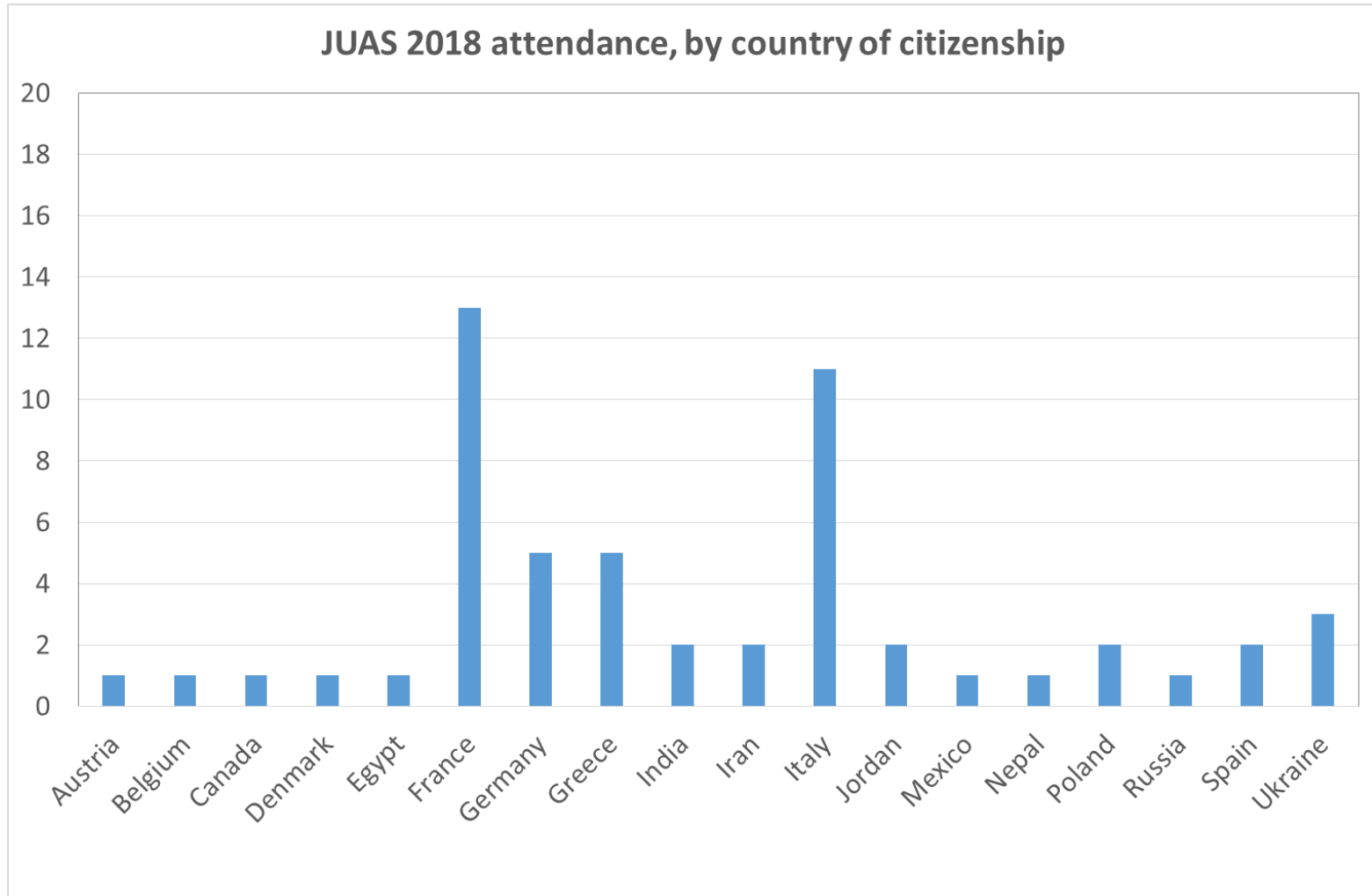
- The European Synchrotron Radiation Facility (ESRF) in Grenoble, France offers the possibility to some JUAS students to take part in a Machine Development session at their premises, on the booster and on the storage ring
- For practical reasons, this is limited to two groups of 4 students each (maximum)
- The time slot is **Saturday 20 January 2018 from 15h00 to 23h00**
 - Due to the late finish, the students will spend the night in Grenoble and return on the next day
 - Transport will be arranged and paid by ESI
 - Accommodation will be arranged and paid by ESRF
- **In view of the short delay, interested students should declare their interest to participate by Tuesday 9 January 17h00**
- The selection of students will be made by the JUAS director

IPAC Prize for JUAS Student

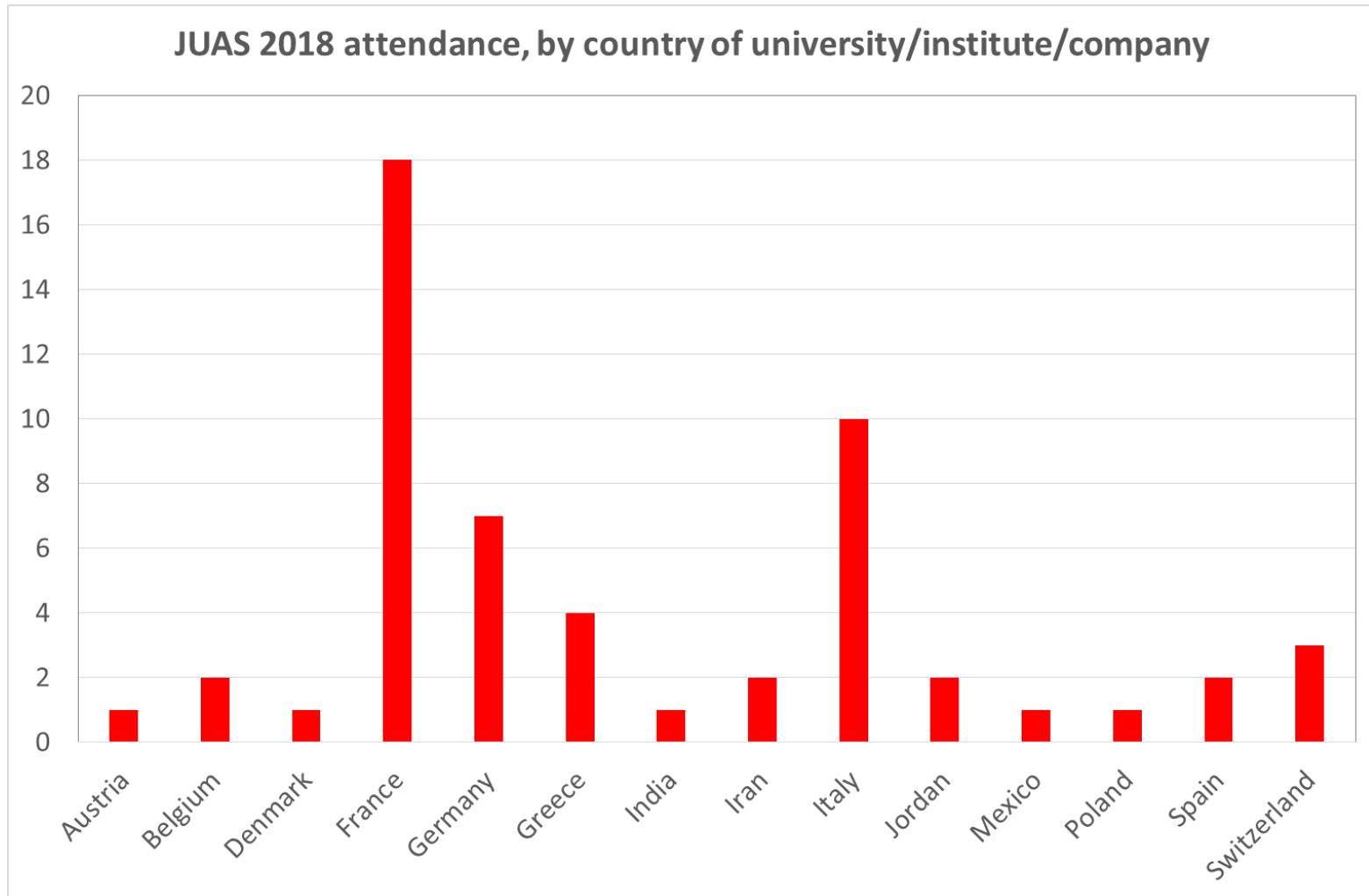
- A JUAS student is allotted a prize by the IPAC Committee for **attending the IPAC conference**
- The proposal is made by the JUAS director to the IPAC Conference Coordinator, based on the following **criteria**
 - To obtain the best mark at the examination of Course 1
 - To continue his/her career 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,...)



Origin of JUAS 2018 students



Origin of JUAS 2018 students



JUAS code of conduct

- **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*

- **Behaviour**

- **Arrive on time** at the lectures
- **Individual and collective behaviour** must not impair reputation of JUAS... but rather improve it!

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>

Developing the JUAS network

- CV Yearbook
 - We publish a CV (curriculum vitae) Yearbook
 - Introducing JUAS,
 - Containing the curriculum vitae of each JUAS 2018 student (with his/her agreement)
 - Available to the students,
 - 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!

Remember to declare your interest for the practical work at ESRF by tomorrow 17h00!