

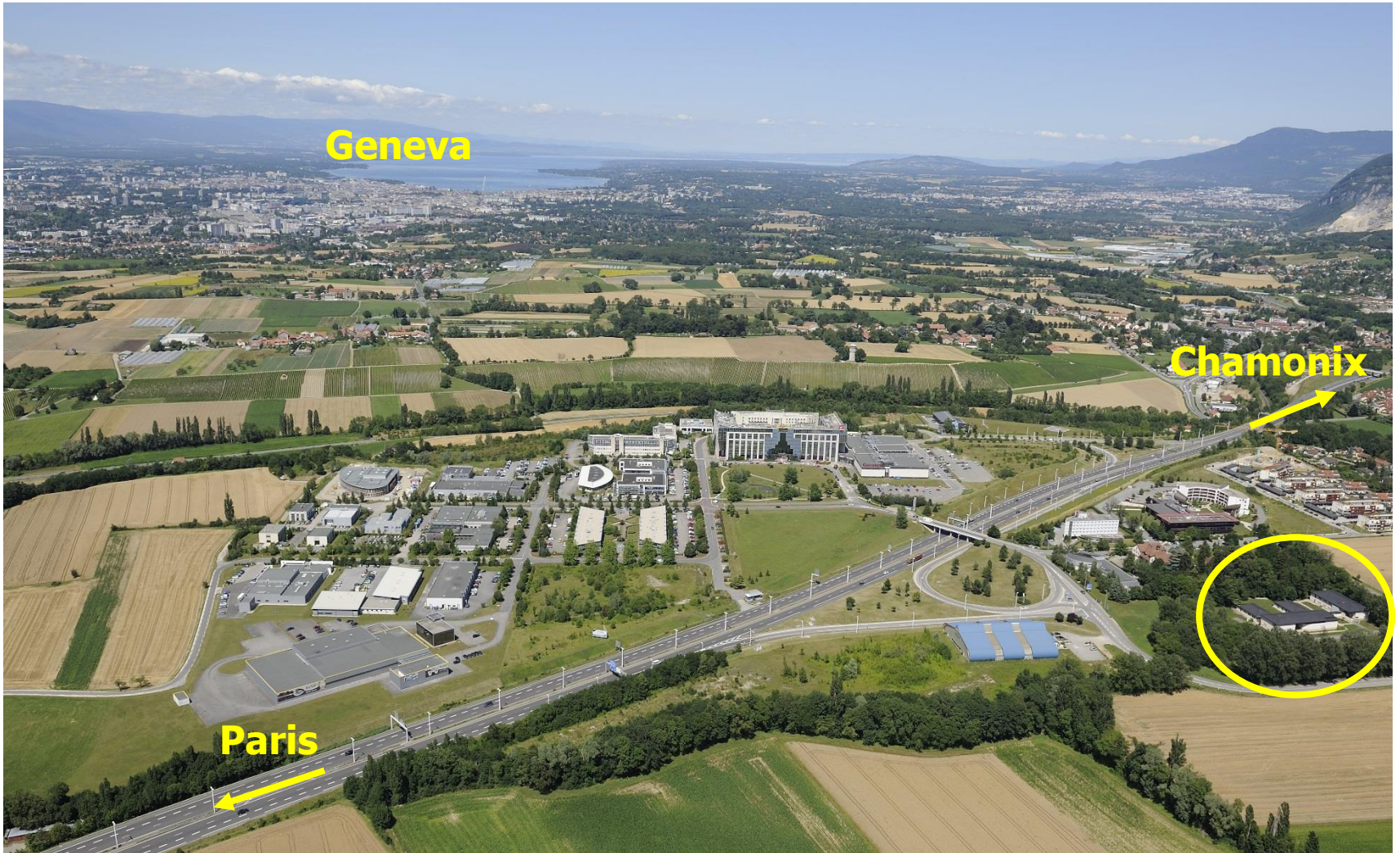
Welcome to JUAS 2017 Course 1

The science of particle accelerators

Philippe Lebrun
Director, JUAS

ESI Archamps Technopole
9 January 2017

ESI Archamps Technopole, host of JUAS



ESI Archamps Technopole Facilities for scientific schools



Lecture hall

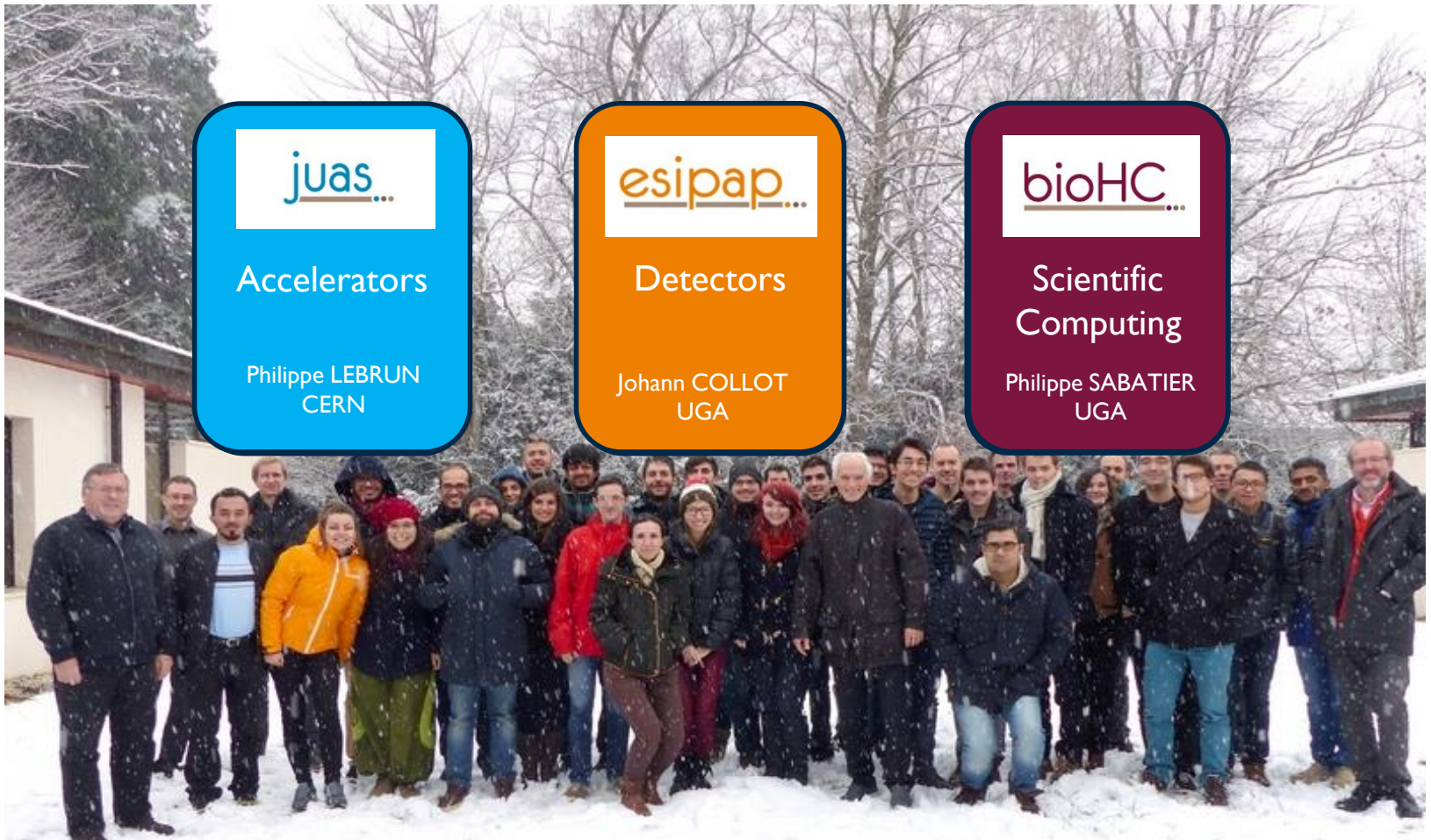


Computer room



Student foyer

Scientific Schools at ESI Archamps Technopole



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

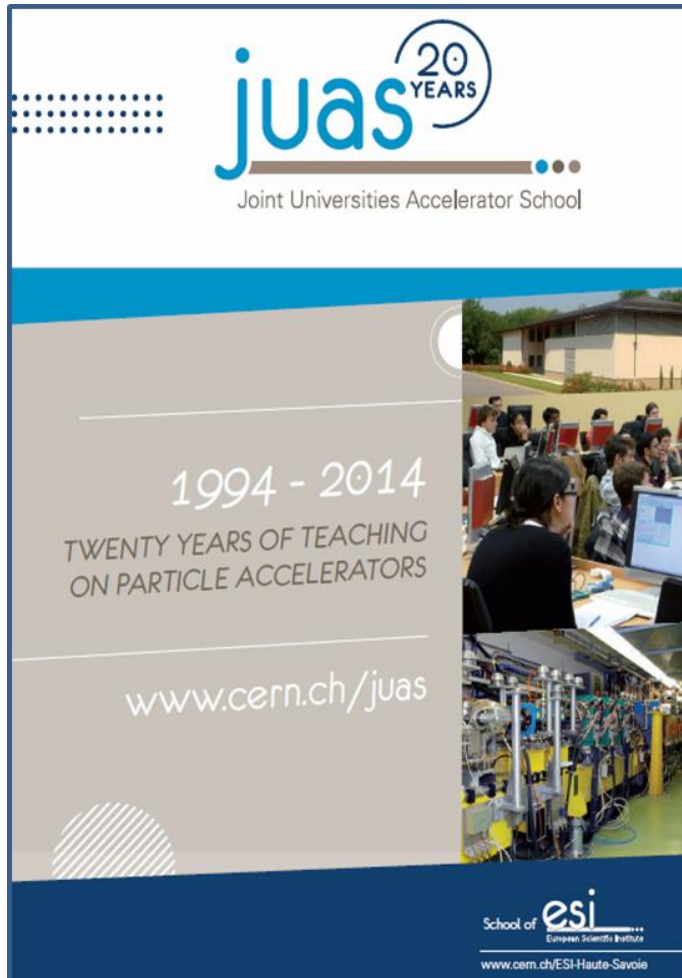
16 Partner Universities



22 Sponsor Institutes and European Programs



JUAS is 23 years old



- 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
- About 1000 students trained at JUAS since 1994

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 and Relativity) available to students well before the course for personal work
- Written exams
- Oral presentations by students on design workshops and practical work

JUAS Student Certification

- JUAS and home institutions of students
 - Master Students: for each course, the Partner University can give ECTS credits to its students who have passed the examination
 - 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
 - Lecture topics and numbers of hours
 - Exam taken or not
 - Marks obtained in relation to Pass/Fail levels

juas		WEEK 1				
Schedule 2017	Monday Jan 9th	Tuesday Jan 10th	Wednesday Jan 11th	Thursday Jan 12th	Friday Jan 13th	
09:00	Arrival and registration at ESI Office & Accommodation	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 Accelerator Design 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 tutorial <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 lecture <i>H. Henke</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>	Intro. to the Mini-Workshop lecture <i>Ph. Bryant</i>	
12:15		12:00 ESI WELCOME & BUILDING VISIT	Relativity lecture <i>H. Henke</i>	Electro-magnetism lecture <i>H. Henke</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>	Bus leaves at 12:15 from JUAS <i>(Lunch at CERN, offered by ESI)</i> VISIT AT CERN Presentation of CERN and visit of CMS Bus leaves at 18:00 from CERN
14:00		12:30 WELCOME LUNCH OFFERED BY ESI	BREAK	BREAK	BREAK	
15:00		Presentation of JUAS & Presentation of students 2017 <i>P. Lebrun</i>	Electro-magnetism lecture <i>H. Henke</i>	Particle optics lecture <i>J.M. De Conto</i>	Intro. to Accelerator Design lecture <i>Ph. Bryant</i>	
16:00		Relativity lecture <i>H. Henke</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>	
16:15		Coffee Break	Coffee Break	Coffee Break	Coffee Break	
17:15		History of Part. Accel. Seminar <i>V. Vaccaro</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>	

juas		WEEK 2			
Schedule 2017	Monday Jan 16th	Tuesday Jan 17th	Wednesday Jan 18th	Thursday Jan 19th	Friday Jan 20th
09:00	Bus leaves at 07:30 from JUAS (2 hours of travel by bus) VISIT AT ESRF				
10:00		Longitudinal Dynamics lecture <i>E. Métral</i>	Linacs lecture <i>J-B. Lallement</i>	Longitudinal Dynamics lecture <i>E. Métral</i>	Cyclotrons lecture <i>B. Jacquot</i>
10:15		Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:15		Longitudinal Dynamics tutorial <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral</i>	Longitudinal Dynamics lecture <i>E. Métral</i>	Cyclotrons lecture <i>B. Jacquot</i>
12:15		Longitudinal Dynamics lecture <i>E. Métral</i>	Longitudinal Dynamics tutorial <i>E. Métral/B. Salvant</i>	Longitudinal Dynamics lecture <i>E. Métral</i>	Cyclotrons tutorial <i>B. Jacquot</i>
14:00	14:00 - 16:00 Injection / Extraction lecture <i>Thomas Perron</i>	BREAK	BREAK	BREAK	BREAK
15:00		Linacs lecture <i>J-B. Lallement</i>	Longitudinal Dynamics lecture <i>E. Métral</i>	Cyclotrons lecture <i>B. Jacquot</i>	Longitudinal Dynamics lecture <i>E. Métral</i>
16:00		Linacs lecture <i>J-B. Lallement</i>	Linacs tutorial <i>J-B. Lallement /V. Dimov</i>	Cyclotrons tutorial <i>B. Jacquot</i>	Longitudinal Dynamics tutorial <i>E. Métral/B. Salvant</i>
16:15	Bus leaves at 17:00 from ESRF	Coffee Break	Coffee Break	Coffee Break	Coffee Break
17:15		Linacs tutorial <i>J-B. Lallement /V. Dimov</i>	Linacs tutorial <i>J-B. Lallement /V. Dimov</i>	Cyclotrons lecture <i>B. Jacquot</i>	Longitudinal Dynamics tutorial <i>E. Métral/B. Salvant</i>
18:15		LHC & Future High-Energy Circular Collider Seminar <i>F. Bordy</i>			

juas		WEEK 3				
Schedule 2017	Monday Jan 23rd	Tuesday Jan 24th	Wednesday Jan 25th	Thursday Jan 26th	Friday Jan 27th	
09:00	Transverse Dynamics lecture <i>A. Latina</i>	Transverse Dynamics lecture <i>A. Latina</i>	Transverse Dynamics lecture <i>A. Latina</i>	Space charge lecture <i>M. Migliorati</i>	Space charge lecture <i>M. Migliorati</i>	
10:00	Coffee Break	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>	Space charge lecture <i>M. Migliorati</i>	Instabilities lecture <i>M. Migliorati</i>	
11:15	Transverse Dynamics tutorial <i>A. Latina</i>	Transverse Dynamics tutorial <i>A. Latina / D. Pellegrini</i>	Transverse Dynamics tutorial <i>A. Latina / D. Pellegrini</i>	Space charge lecture <i>M. Migliorati</i>	Instabilities tutorial <i>M. Migliorati</i>	
12:15	WELCOME LUNCH OFFERED BY ESI (ESIPAP OPENING)	BREAK	BREAK	BREAK	BREAK	
14:00	Transverse Dynamics lecture <i>A. Latina</i>	MADX <i>G. Sterbini / A. Latina / H. G. Morales / D. Pellegrini</i>	Transverse Dynamics lecture <i>A. Latina</i>	Space charge tutorial <i>M. Migliorati</i>	Instabilities tutorial <i>M. Migliorati</i>	
15:00	Intro. to MADX <i>G. Sterbini</i>	MADX <i>G. Sterbini / A. Latina / H. G. Morales / D. Pellegrini</i>	Transverse Dynamics tutorial <i>A. Latina / D. Pellegrini</i>	MADX <i>G. Sterbini / A. Latina / H. G. Morales / D. Pellegrini</i>	MADX <i>G. Sterbini / A. Latina / H. G. Morales / D. Pellegrini</i>	
16:00	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
16:15	Free-Electron Lasers Seminar <i>E. Prat</i>	LHC injectors chain Seminar <i>R. Alemany</i>	Future High-Energy Linear Colliders Seminar <i>L. Rinolfi</i>	MADX <i>G. Sterbini / A. Latina / H. G. Morales / D. Pellegrini</i>	MADX <i>G. Sterbini / A. Latina / H. G. Morales / D. Pellegrini</i>	
17:15						

WEEK 4

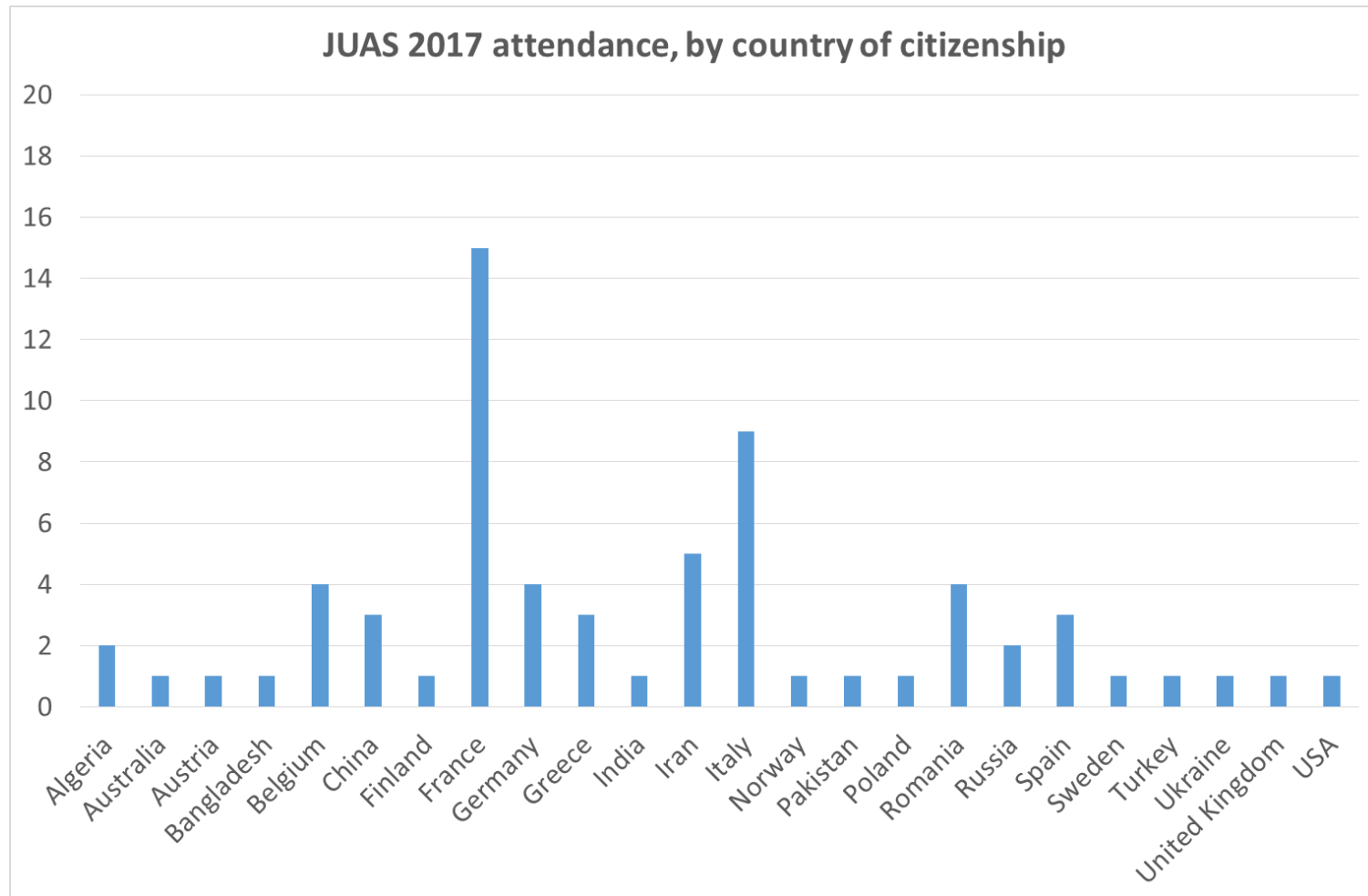
Schedule 2017	Monday Jan 30 th	Tuesday Jan 31 st	Wednesday Feb 1 st	Thursday Feb 2 nd	Friday Feb 3 rd
09:00	Synchrotron Radiation lecture <i>R. Bartolini</i>	Synchrotron Radiation lecture <i>R. Bartolini</i>	Linear imperfections lecture <i>H. Bartosik</i>	Mini-workshop Machine Design <i>Ph. Bryant</i>	Non-linear effects lecture <i>Y. Papaphilippou</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>	Linear imperfections lecture <i>H. Bartosik</i>	Mini-workshop Machine Design <i>Ph. Bryant</i>	Non-linear effects lecture <i>Y. Papaphilippou</i>
11:15	Synchrotron Radiation tutorial <i>R. Bartolini</i>	Synchrotron Radiation tutorial <i>R. Bartolini</i>	Linear imperfections lecture <i>H. Bartosik</i>	Mini-workshop Machine Design <i>Ph. Bryant</i>	Non-linear effects lecture <i>Y. Papaphilippou</i>
12:15	WELCOME LUNCH OFFERED BY ESI	BREAK	BREAK	BREAK	BREAK
14:00	Synchrotron Radiation lecture <i>R. Bartolini</i>	Synchrotron Radiation lecture <i>R. Bartolini</i>	Linear imperfections lecture <i>H. Bartosik</i>	Mini-workshop Machine Design <i>R. Bartolini</i>	Non-linear effects lecture <i>Y. Papaphilippou</i>
15:00	Synchrotron Radiation lecture <i>R. Bartolini</i>	Synchrotron Radiation lecture <i>R. Bartolini</i>	Linear imperfections lecture <i>H. Bartosik</i>	Mini-workshop Machine Design <i>R. Bartolini</i>	Presentation of Accelerator Design <i>Students + P. Bryant</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>	Linear imperfections tutorial <i>H. Bartosik</i>	Mini-workshop Machine Design <i>R. Bartolini</i>	Presentation of Light Source Design <i>Students + R. Bartolini</i>
17:15			Laser Plasma Acceleration Seminar <i>R. Assmann</i>		
18:15					

juas		WEEK 5			
Schedule 2017	Monday Feb 6th	Tuesday Feb 7th	Wednesday Feb 8th	Thursday Feb 9th	Friday Feb 10th
09:00	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		BREAK	BREAK	CLOSING RECEPTION JUAS COURSE 1	
14:00					
15:00					
16:00					
16:15					
17:15					

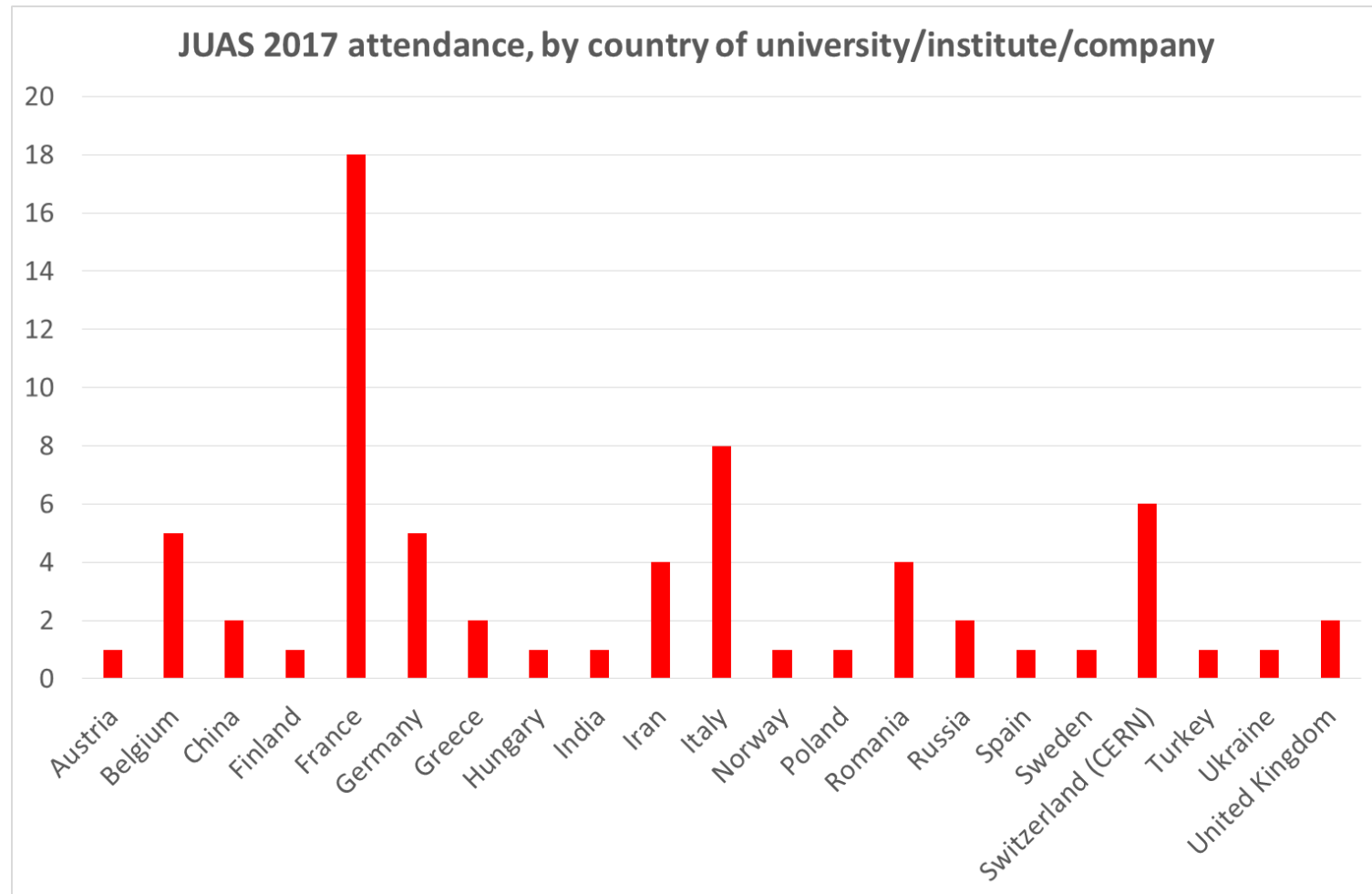
JUAS 2017 Course 1 Examination

- Written examination
- 5 topics, each allocated one and a half hour
 - Transverse beam dynamics (coefficient 12)
 - Longitudinal beam dynamics (coefficient 12)
 - Synchrotron radiation (coefficient 12)
 - Remaining two topics (each coefficient 6) to be announced in week 4 (i.e. one week before examination)
- Permitted for exam: all written documents, pocket calculator
- Strictly forbidden for exam: connected electronic devices
- Marks
 - Out of 20
 - Pass level: average mark $\geq 10/20$

Origin of JUAS 2017 students



Origin of JUAS 2017 students



JUAS code of conduct

- The basic **rule** is applicable French Law
- **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>

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 follow JUAS Courses 1 and 2 completely
 - 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 and contribution to the proceedings
 - To serve as required at the Conference (e.g. scientific secretary of session, man the JUAS booth,...)



The poster for the 8th International Particle Accelerator Conference (IPAC17) features a background image of a long bridge over water. The text is arranged as follows:

- IPAC17** logo (with a stylized particle path) and **8th International Particle Accelerator Conference** title.
- 14-19 May 2017** and **Bella Center, Copenhagen, Denmark**.
- A circular badge on the right: **Registration and abstract submission opens September 2016**.
- Local Organising Committee** section with a list:
 - Organising Committee Chair: Gianluigi Arduini, CERN
 - Scientific Programme Committee Chair: Mike Seidel, PSI
 - Local Organising Committee Chair: Mats Lindroos, ESS
- ipac17.org** at the bottom right.

Developing JUAS network

- CV Yearbook
 - We intend to publish a CV (curriculum vitae) Yearbook
 - Introducing JUAS,
 - Containing the one-page curriculum vitae of each JUAS 2017 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!

