Welcome to JUAS 2017 Course 2

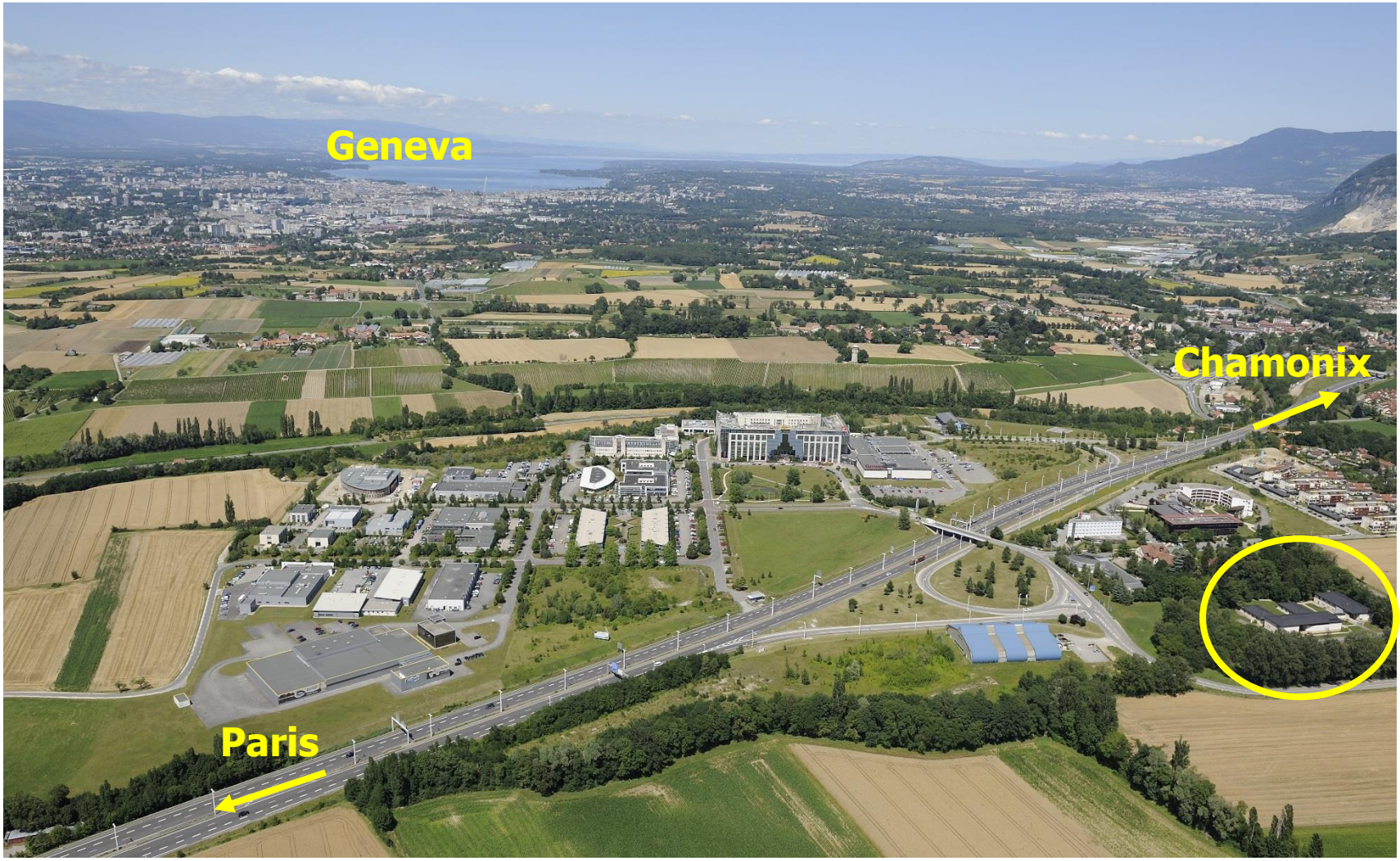
The technology and applications of particle accelerators

Elias Métral
Deputy Director, JUAS

ESI Archamps Technopole

13 February 2017

ESI Archamps Technopole, host of JUAS



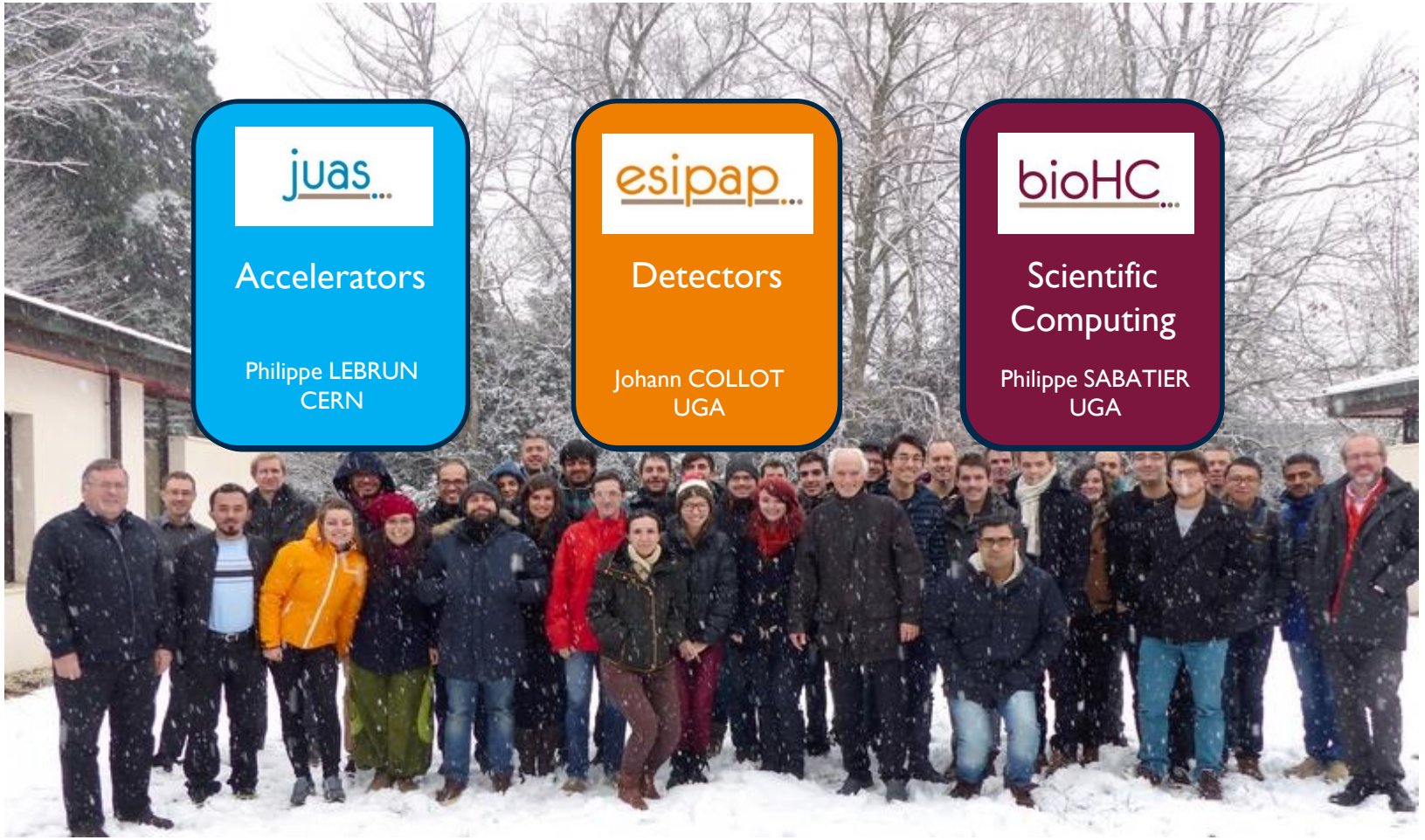
ESI Archamps Technopole
Facilities for scientific schools

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

UNIVERSITÀ DEGLI STUDI
DI GENOVA

22 Sponsor Institutes and European Programs

Europe

Germany

France

Spain

Italy

United Kingdom

Switzerland

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

WEEK 6

Schedule 2017	Monday Feb 13th	Tuesday Feb 14th	Wednesday Feb 15th	Thursday Feb 16th	Friday Feb 17th
09:00					
	Arrival and registration at ESI Office & Accommodation	**Introduction to RF** lecture *A. Mostacci*	**Vacuum systems** lecture *V. Baglin*	**RF Engineering** lecture *F. Caspers*	**RF Engineering** lecture *F. Caspers*
10:00		**Coffee Break**	**Coffee Break**	**Coffee Break**	**RF Engineering** tutorial *F. Caspers / M. Wendt*
10:15		**Introduction to RF** lecture *A. Mostacci*	**Vacuum systems** lecture *V. Baglin*	**Vacuum systems** lecture *V. Baglin*	
11:15		**Vacuum systems** lecture *V. Baglin*	**Vacuum systems** tutorial *V. Baglin / R. Kersevan*	**Vacuum systems** tutorial *V. Baglin / R. Kersevan*	**Coffee Break**
12:15	**12:00 ESI WELCOME & BUILDING VISIT**	**BREAK**	**BREAK**	**BREAK**	***Bus leaves at 11:30 from JUAS***
	12:30 WELCOME LUNCH OFFERED BY ESI				***(Lunch at CERN, offered by ESI)***
14:00	**Presentation of JUAS & Presentation of students 2017** *E. Métral*	**Vacuum systems** lecture *V. Baglin*	**RF Engineering** lecture *F. Caspers*	**RF Engineering** lecture *F. Caspers*	**VISIT AT CERN**
15:00	**Introduction to CERN practical days** *Magnet, Superconductivity*	**RF Engineering** lecture *F. Caspers*	**RF Engineering** tutorial *F. Caspers / M. Wendt*	**RF Engineering** tutorial *F. Caspers / M. Wendt*	***AD / ELENA LINAC / LEIR***
16:00	**Coffee Break**	**Coffee Break**	**Coffee Break**	**Coffee Break**	
16:15	**Introduction to CERN practical days** *RF, Vacuum*	**RF Engineering** lecture *F. Caspers*	**Accelerator driven system** Seminar *D. Vandeplassche*	**RF Engineering** lecture *F. Caspers*	***Bus leaves at 18:00 from CERN***
17:15					

WEEK 7

Schedule 2017	Monday Feb 20th	Tuesday Feb 21st	Wednesday Feb 22nd	Thursday Feb 23rd	Friday Feb 24th
09:00	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** tutorial *P. Forck*	***Bus leaves at 8:00 from JUAS*** ***(4 hours of travel by bus)***	
10:00 10:15	**Coffee Break**	**Coffee Break**	**Coffee Break**		
11:15	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** tutorial *P. Forck*	**VISIT AT PSI**	**VISIT AT PSI**
12:15	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** lecture *P. Forck*		
14:00	**WELCOME LUNCH OFFERED BY ESI (ESIPAP OPENING)**	**BREAK**	**BREAK**	***(Lunch offered by PSI)***	***(Lunch offered by PSI)***
15:00	**Beam instrumentation** tutorial *P. Forck*	**Superconducting RF Cavities** lecture *F. Caspers*	**Superconducting RF Cavities** tutorial *F. Caspers*		
16:00 16:15	**Beam instrumentation** tutorial *P. Forck*	**Superconducting RF Cavities** lecture *F. Caspers*	**Superconducting RF Cavities** tutorial *F. Caspers*	**15:00 - 16:00 Accel. for hadron therapy** Seminar *M. Schippers*	
17:15	**Coffee Break**	**Coffee Break**	**Coffee Break**		
18:15	**Beam instrumentation** lecture *P. Forck*	**Superconducting RF Cavities** lecture *F. Caspers*	**Superconducting RF Cavities** lecture *F. Caspers*	**16:00 - 18:00 Accelerators Controls** lecture *E. Zimoch* ***(Dinner offered by PSI, night at PSI offered by ESI)***	***Bus leaves at 17:30 from PSI*** ***(4 hours of travel by bus)***
		Building Large Accelerators with Industry Seminar *Ph. Lebrun*			

WEEK 8

Schedule 2017	Monday Feb 27th	Tuesday Feb 28th	Wednesday March 1st	Thursday March 2nd	Friday March 3rd
09:00					
	Introduction to Magnets I lecture *D. Tommasini*	**Superconducting magnets** lecture *M. Wilson / P. Ferracin*	**Mini-workshop Normal conducting Magnets** *J. Bauche & T. Zickler*	***Bus leaves at 8:00 from JUAS***	***Bus leaves at 8:00 from JUAS***
10:00					
10:15	**Introduction to Magnets II** lecture *D. Tommasini*	**Coffee Break**	**Coffee Break**	***(Lunch at CERN, offered by ESI)***	***(Lunch at CERN, offered by ESI)***
10:30	**Coffee Break**	**Superconducting magnets** lecture *M. Wilson / P. Ferracin*	**Mini-workshop Normal conducting Magnets** *J. Bauche & T. Zickler*		
	10:45 Normal Conducting magnets lecture *T. Zickler*			**PRACTICAL WORKS AT CERN**	**PRACTICAL WORKS AT CERN**
11:15		**Superconducting magnets: cryogenics** lecture *Ph. Lebrun*	**Mini-workshop Normal conducting Magnets** *J. Bauche & T. Zickler*		
12:15	**WELCOME LUNCH OFFERED BY ESI**	**BREAK**	**BREAK**	RF coordinator: **F. Caspers**	RF coordinator: **F. Caspers**
14:00	**Superconducting magnets** lecture *M. Wilson / P. Ferracin*	**Superconducting magnets** lecture *M. Wilson / P. Ferracin*	**Mini-workshop Superconducting Magnets** *M. Wilson & P. Ferracin & D. Schoerling*	VACUUM coordinator: **P. Chiggiato**	VACUUM coordinator: **P. Chiggiato**
15:00	**Superconducting magnets** lecture *M. Wilson / P. Ferracin*	**Normal Conducting magnets** lecture - *T. Zickler*	**Mini-workshop Superconducting Magnets** *M. Wilson & P. Ferracin & D. Schoerling*	MAGNETS coordinator: **J. Bauché**	MAGNETS coordinator: **J. Bauché**
16:00				SUPERCONDUCTIVITY coordinator: **J. Fleiter**	SUPERCONDUCTIVITY coordinator: **J. Fleiter**
16:15	**Coffee Break**	**Coffee Break**	**Coffee Break**		
	Normal Conducting magnets lecture - *T. Zickler*	**Normal Conducting magnets** lecture - *T. Zickler*	**Mini-workshop Superconducting Magnets** *M. Wilson & P. Ferracin & D. Schoerling*	***Bus leaves at 17:30 from CERN***	***Bus leaves at 17:30 from CERN***
17:15					
	Normal Conducting magnets lecture - *T. Zickler*	**Normal Conducting magnets** lecture - *T. Zickler*			
18:15					

WEEK 9

Schedule 2017	Monday March 6th	Tuesday March 7th	Wednesday March 8th	Thursday March 9th	Friday March 10th
09:00	**Particle Sources** lecture *T. Thuillier*	**Low Energy Electron Accelerators** lecture *W. Mondelaers*	***Bus leaves at 7:30 from JUAS***	**Life-cycle and reliability of particle accelerators** lecture *S. Meyroneinc*	**High Current Proton Linacs** lecture *S. Bousson*
10:00 10:15	**Coffee Break**	**Coffee Break**		**Coffee Break**	**Coffee Break**
	Particle Sources lecture *T. Thuillier*	**Low Energy Electron Accelerators** lecture *W. Mondelaers*	***(Lunch offered by Bergoz)***	**Life-cycle and reliability of particle accelerators** lecture *S. Meyroneinc*	**High Current Proton Linacs** lecture *S. Bousson*
11:15	**Particle Sources** lecture *T. Thuillier*	**Low Energy Electron Accelerators lecture** *W. Mondelaers*		**Life-cycle and reliability of particle accelerators** lecture *S. Meyroneinc*	**High Current Proton Linacs** lecture *S. Bousson*
12:15	**WELCOME LUNCH OFFERED BY ESI**	**BREAK**	**VISIT AND EXPERIMENTAL WORK AT BERGOZ INSTRUMENTATION**	**SANDWICH SNACK OFFERED BY ESI**	**BREAK**
14:00	**Particle Sources** tutorial *T. Thuillier*	**Acc. for medical & industrial applications** lecture *W. Kleeven*		***Bus leaves at 13:30 from JUAS***	**Radiation safety** lecture *X. Queralt*
15:00	**Particle Sources** lecture *T. Thuillier*	**Acc. for medical & industrial applications** lecture *W. Kleeven*		**Radiation Oncology Biology and Physics Clinical Applications** lecture *R. Miralbell*	**Radiation safety** lecture *X. Queralt*
16:00 16:15	**Coffee Break**	**Coffee Break**		**Therapeutic Applications at Geneva Hospital**	**Coffee Break**
17:15	**From methodology of inventiveness to applications of plasma acceleration** Seminar - *Andrei Seryi*	**Acc. for medical & industrial applications** lecture *W. Kleeven*	***Bus leaves at 17:00 from BERGOZ***	***Bus leaves at 17:30 from HUG***	**Radiation safety** lecture *X. Queralt*

WEEK 10

Schedule 2017	Monday March 13th	Tuesday March 14th	Wednesday March 15th	Thursday March 16th	Friday March 17th
09:00					
	Presentation of reports on practical work	EXAMINATION Beam Instrumentation *Written session*	EXAMINATION RF *Written session*	EXAMINATION Magnets *Written session*	Space Projects Seminar *Isabelle Rongier & Jan Droz*
10:30	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:00	Presentation of reports on practical work	EXAMINATION topic to be announced *Written session*	EXAMINATION topic to be announced *Written session*	DISCUSSION SUMMARY OF JUAS LECTURES	Space Projects Seminar *Isabelle Rongier & Jan Droz*
12:30	BREAK	BREAK	BREAK	CLOSING RECEPTION JUAS COURSE 2	CLOSING RECEPTION ESIPAP MODULE 2
14:00	Preparation of examinations				Space Projects Seminar *Isabelle Rongier & Jan Droz*
15:00					
16:00					Coffee Break
16:15					
17:15					

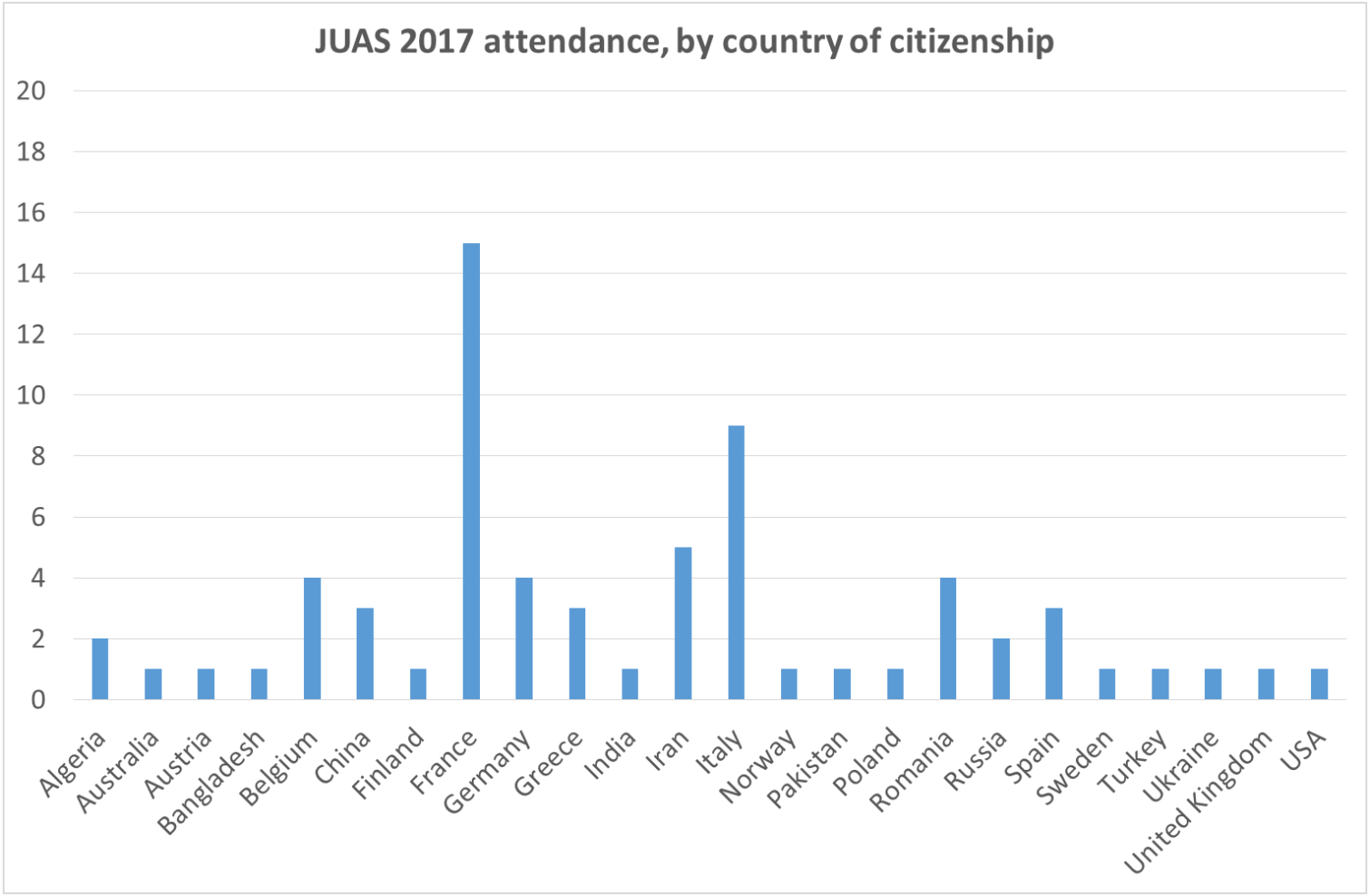
JUAS 2017 Course 2 Examination

- Written examination
  - 5 topics, each allocated one and a half hour
    - RF engineering (coefficient 12)
    - Magnets, normal-conducting (coefficient 12)
    - Beam instrumentation (coefficient 12)
    - Remaining two topics (each coefficient 6) to be announced in week 9 (i.e. one week before examination)
  - Permitted for exam: all written documents, pocket calculator
  - Strictly forbidden for exam: connected electronic devices
- Written report
  - SC magnet design workshop (coefficient 3)
- Oral reports
  - Practical days at CERN (coefficient 3)
- Marks
  - Out of 20
  - Pass level: average mark ≥ 10/20

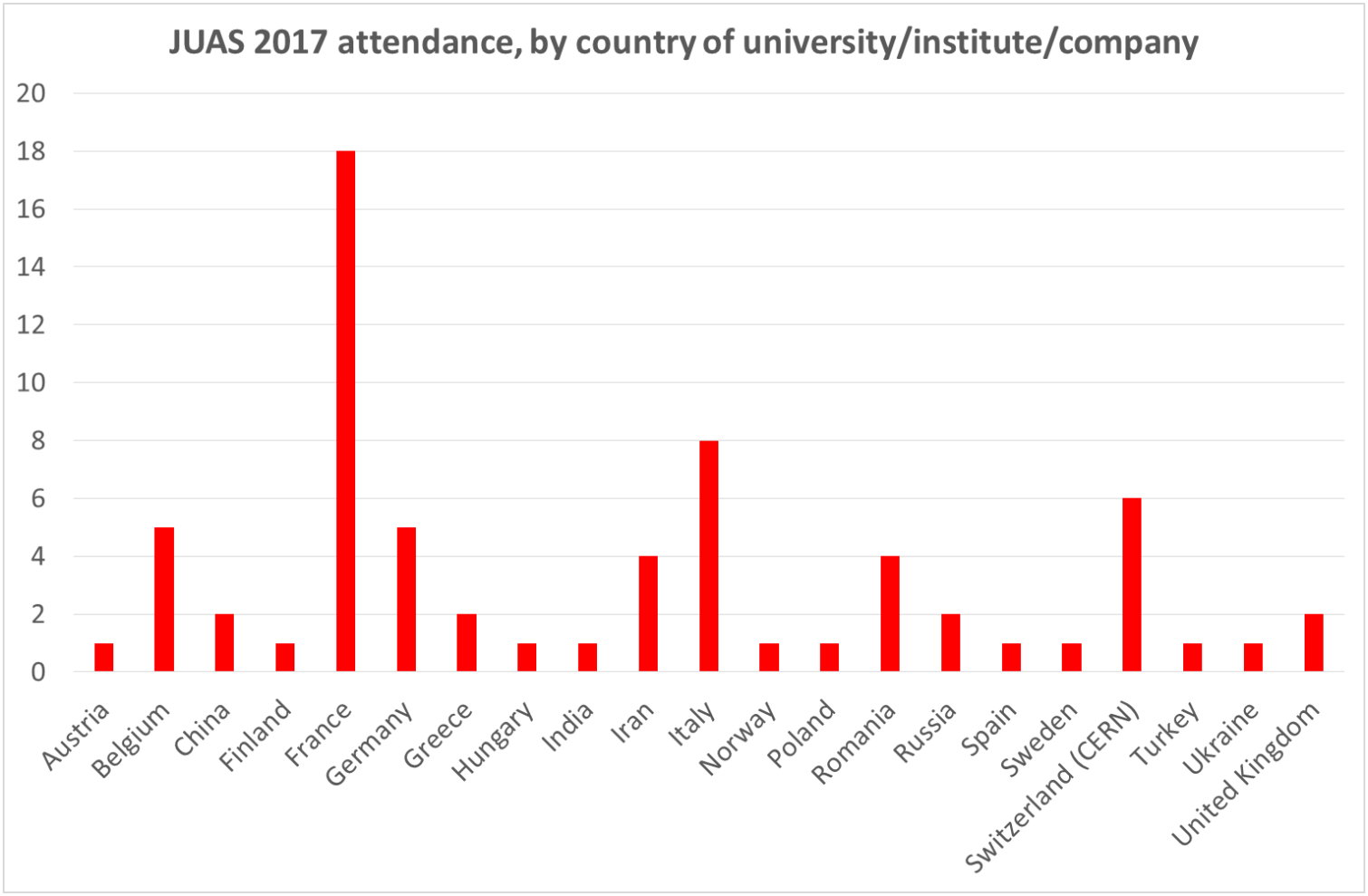
Evaluation of the lectures

- 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 tutorials
  - Lecturer approachable and open to questions
- 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

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

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!