European Scientific Institute

Joint Universities Accelerator School

WELCOME TO JUAS 2016

Louis Rinolfi, Director

Monday 15th February 2016

Course 2: Technology & Applications of Particle Accelerators

Brief history of JUAS

See slides course 1

"Science & Physics of Particle Accelerators"

on Indico

Monday 11th January 2016
at 14:30

Link to Presentation JUAS 2016 Course 1

JUAS in a few words

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Joint Universities Accelerator School

ECTS credits from European Universities

Participation to International conferences

Practical works at CERN

Practical works at Bergoz company

Visits CERN, Paul Scherrer Institut and Geneva hospital

haute savoie
le Département

ARCHAMPS TECHNOPOLE
Porte sud de Genève

esi
European Scientific Institute

Hans Hoffmann, President of ESI

Presentation of ESI team by Marie Gauthier

France

Université Joseph Fourier Grenoble

Grenoble INP

Université Paris Sud

Germany

Technische Universität Darmstadt

KIT Karlsruhe Institute of Technology

TU berlin

Universität Rostock Traditio et Innovatio

JUAS 2016

15 partner universities

Italy

Sapienza Università di Roma

Università degli Studi di Genova

Università degli Studi di Napoli Federico II

Spain

UAB Universitat Autònoma de Barcelona

Universitat de València

UPC Universitat Politècnica de Catalunya

United Kingdom

University of Liverpool

JAI John Adams Institute for Accelerator Science

University of Oxford

Logos of JUAS 2016 sponsors

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France

Germany

Italy

Sweden

Switzerland

UK

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INTENSIVE PROGRAM
FOR MASTER & PHD STUDENTS

MODULAR COURSES
FOR PROFESSIONALS

ACCREDITED BY
PARTNER UNIVERSITIES (ECTS)

TWO COURSES ON PARTICLE ACCELERATORS

11 January to 18 March **2016**

Course 1
SCIENCES & PHYSICS
11 January to 12 February

Course 2
TECHNOLOGY & APPLICATIONS
15 February to 18 March




PARTNER UNIVERSITIES:

School of esi European Scientific Institute

www.esi-archamps.eu

With the support of:

ESI / JUAS - Mai 2015 - Crédits photo : ESI - CERN - Graphisme : virginie@indelible-creation.com

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JUAS Poster 2016

Available upon request

Ask Marjorie Romand for any paper copy in format (A4,…A0).

	Countries	Students
1	Armenia	1
2	Austria	1
3	Belgium	4
4	China	6
5	Czech Republic	1
6	Finland	1
7	France	22
8	Germany	5
9	Greece	4
10	Hungary	1
11	India	2
12	Iran	1
13	Italy	11
14	Jordan	1
15	Lebanon	1
16	Mexico	1
17	Spain	2
18	Ukraine	4
19	UK	1
	19	70

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Participants in 2016 by country

(Alphabetic order)

Professors and assistants in 2016 – Course 2

Professors / Assistants	Lecture	Home
F. Caspers / M. Wendt	RF engineering including superconductivity	CERN
P. Chiggiato / R. Kersevan	Vacuum	CERN
Tommasini	Magnets design	CERN
T. Zickler / J. Bauche	Normal conducting magnets	CERN
M. Wilson / P. Lebrun	Superconducting magnets	Oxford / CERN
P. Forck	Beam instrumentation	GSI - Darmstadt
T. Thuillier	Particle sources	LPSC - Grenoble
E. Zimoch	Accelerator control	PSI - Villigen
W. Mondelears	Low energy electron accelerators	Gent university
W. Kleeven	Accelerators for industrial & medical appl.	IBA - Belgium
S. Bousson	High current proton linacs	IN2P3/IPNO - Orsay
R. Miralbell	Radiation oncology biology & physics	HUG - Geneva
S. Meyroneinc	Life cycle and reliability of accelerators	Institut Curie - Paris
X. Queralt	Radiation safety	STFC / ISIS Rutherford

Practical days at CERN in 2016 – Course 2

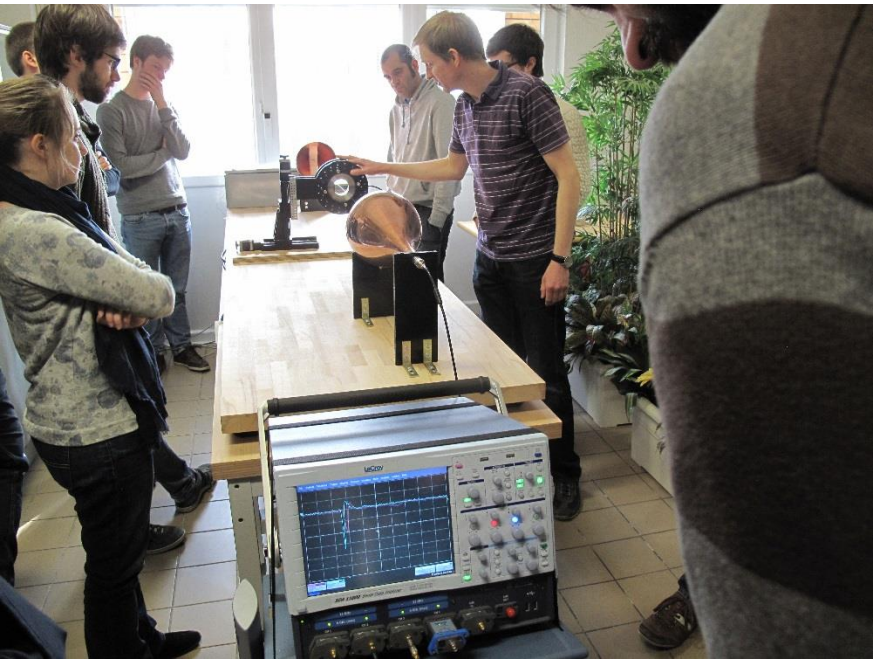
Professors	Activities	Site
F. Caspers + assistants	RF engineering measurements	Building 864 - Prevessin
P. Chiggiato + assistants	Vacuum measurements	Buildings 30, 101, 113
T. Zickler + assistants	Normal conducting magnets measurements	Lab I8 (ISR)
J. Fleiter + assistants	Superconducting magnets measurements	Building 163 + SM 18
W. Farabolini + assistants	CTF3 beam measurements	Building 2008

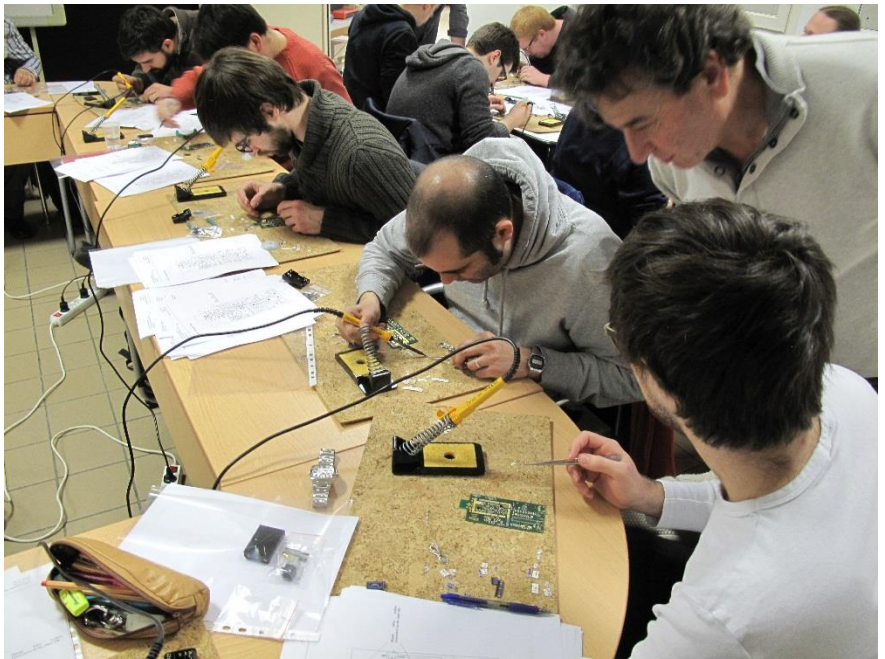
These measurements are taking place during 2 days consecutive

Each student will perform 2 different practical works

Practical day at Bergoz in 2016 – Course 2

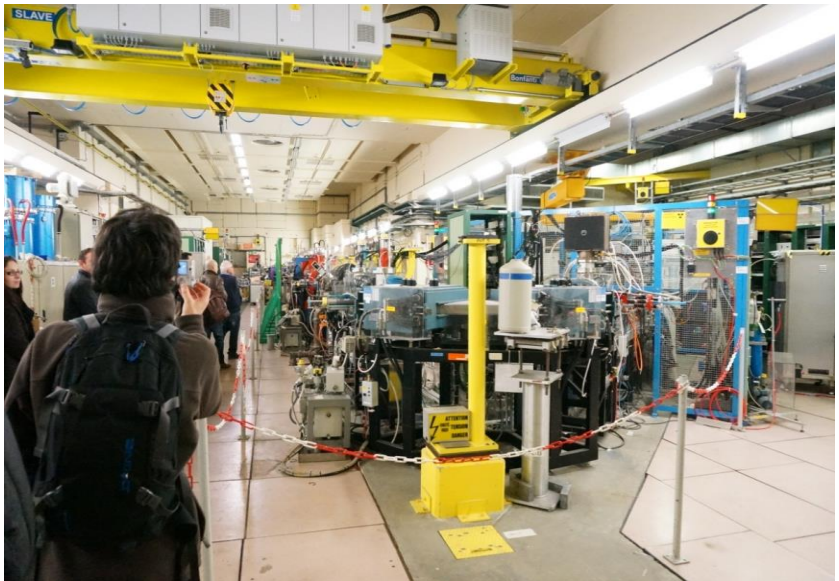
Supervisors	Activities	Home
H. Bayle X. Blanc H. Chen L. Dupuy A. Murtro F. Stulle	Construction of beam diagnostic devices and measurements of the characteristics of the devices.	Saint-Genis-Pouilly

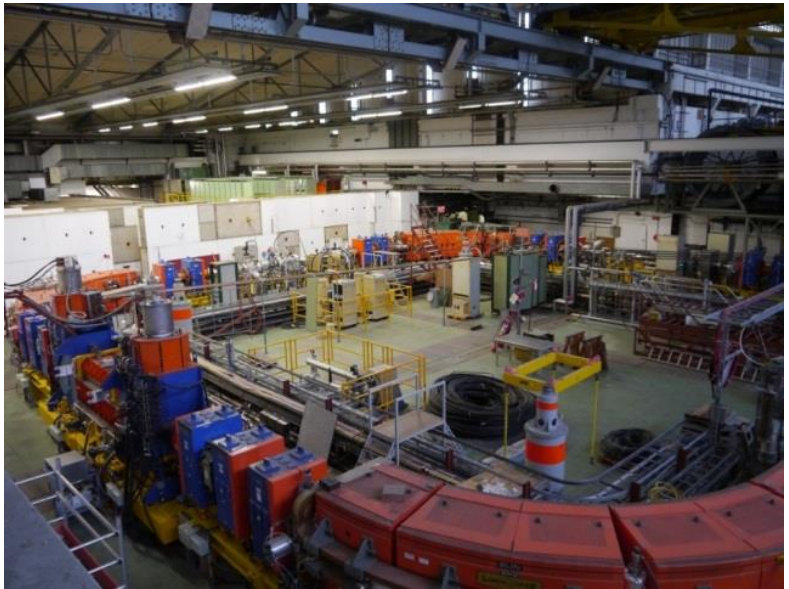




Visits in 2016 – Course 2

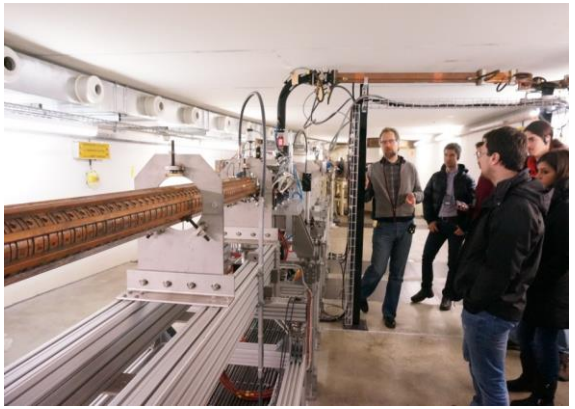
Coordinators	Machines	Site
F. Caspers + assistants	Linacs, AD, LEIR, RF stands, ….	CERN Meyrin
F. Tecker + assistants	CTF3	CERN Meyrin
T. Garvey + assistants	SLS, Swiss FEL, Cyclotrons, ….	PSI - Villigen
R. Miralbell + assistants	Radiation therapy rooms at the hospital	HUG - Geneva





The Cyclotron

The SLS Linac



The Swiss FEL Injector

Hôpitaux Universitaires de Genève (HUG)

The Irradiation machine at HUG

Seminars in 2016 – Course 2

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Professors	Lecture (1h)	Home
J.L. Biarotte	Accelerators Driven Systems (ADS)	IPNO Orsay
M. Schippers	Accelerators for hadron therapy	PSI
P. Lebrun	Performance & technology challenges for LHC	CERN
A. Seryi	From methodology of inventiveness to application of plasma acceleration	Oxford - JAI

Computing room in 2016

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connected to the CERN servers via optical fibres

WEEK 6

	Monday Feb 15th	Tuesday Feb 16th	Wednesday Feb 17th	Thursday Feb 18th	Friday Feb 19th	
08:00	Arrival and registration at ESI Office & Accommodation	RF Engineering lecture *F. Caspers*	Vacuum systems lecture *P. Chiggiato*	RF Engineering lecture *F. Caspers*	RF Engineering lecture *F. Caspers*	09:00
		Coffee Break	Coffee Break	Coffee Break	RF Engineering tutorial *F. Caspers / M. Wendt*	10:00
11:15		RF Engineering tutorial *F. Caspers / M. Wendt*	Vacuum systems lecture *P. Chiggiato*	Vacuum systems lecture *P. Chiggiato*	Coffee Break	11:00 11:15
12:30		RF Engineering lecture *F. Caspers*	Vacuum systems tutorial *P. Chiggiato / R. Kersevan*	Vacuum systems tutorial *P. Chiggiato / R. Kersevan*	***Bus leaves at 11:30 from JUAS*** ***(Lunch at CERN)***	12:15
	WELCOME LUNCH	LUNCH	LUNCH	LUNCH		
14:00	Presentation of ESI & building visit	Vacuum systems lecture *P. Chiggiato*	RF Engineering lecture *F. Caspers*	RF Engineering lecture *F. Caspers*	**VISIT AT CERN**	14:00
14:30	Presentation of JUAS & Presentation of students 2016 L. Rinolfi					
15:30 15:45	Coffee Break	Vacuum systems lecture *P. Chiggiato*	RF Engineering tutorial *F. Caspers / M. Wendt*	RF Engineering tutorial *F. Caspers / M. Wendt*	***(LINACS Visit, AD Visit , RF Measurements)***	15:00 16:00 16:15
16:45	Introduction to CERN practical days *Magnet,Superconductivity*	Coffee Break	Coffee Break	Coffee Break	***Bus leaves at 18:00 from CERN***	17:15
18:15	Introduction to CERN practical days *RF, Vacuum, CTF3*	RF Engineering lecture *F. Caspers*	Accelerator driven system Seminar *J.L. Biarrotte*	RF Engineering lecture *F. Caspers*		

Visit at CERN

Friday 19th February 2016

Programme:

13:00	Lunch at CERN cafeteria
13:45	Walk to PS cafeteria (Building 9)
14:00	Start visits (3 or 4 groups) :
	Linacs 2, 3 , 4
	Low Energy Ion Ring (LEIR)
	Antiproton Decelerator (AD)
	RF stands measurements
17:30	Discussions, Questions and Answers
18:00	Bus start for Archamps

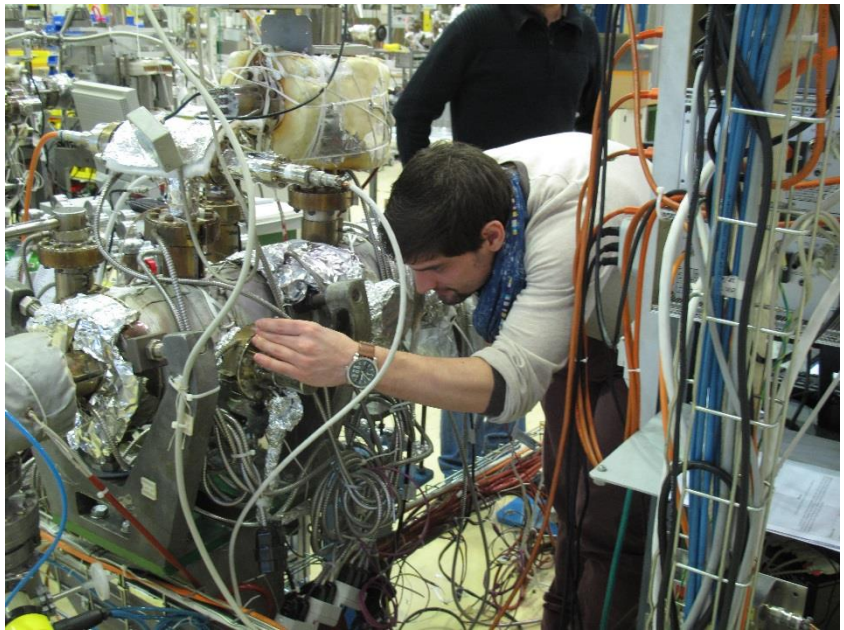
WEEK 7

	Monday Feb 22nd	Tuesday Feb 23rd	Wednesday Feb 24th	Thursday Feb 25th	Friday Feb 26th	
09:00	**Introduction to Magnets I** lecture *D. Tommasini*	**Superconducting magnets** lecture - *M. Wilson*	**Mini-workshop Normal conducting Magnets**	***Bus leaves at 8:00 from JUAS*** ***(lunch at CERN)*** **PRACTICAL WORKS** **AT CERN** RF coordinator: **F. Caspers** VACUUM coordinator: **P. Chiggiato** MAGNETS coordinator: **J. Bauché** SUPERCONDUCTIVITY coordinator: **A. Ballarino** BEAM MEASUREMENTS coordinator: **W. Farabolini**	***Bus leaves at 8:00 from JUAS*** ***(lunch at CERN)*** **PRACTICAL WORKS** **AT CERN** RF coordinator: **F. Caspers** VACUUM coordinator: **P. Chiggiato** MAGNETS coordinator: **J. Bauché** SUPERCONDUCTIVITY coordinator: **A. Ballarino** BEAM MEASUREMENTS coordinator: **W. Farabolini** ***Bus leaves at 17:30 from CERN***	08:00
09:45	**Introduction to Magnets II** lecture *D. Tommasini*	**Coffee Break**	**Coffee Break**			
10:30 10:45	**Coffee Break**	**Superconducting magnets** lecture - *M. Wilson*	*J. Bauche* *T. Zickler*			
	Normal Conducting magnets lecture *T. Zickler*	**Superconducting magnets** lecture - *M. Wilson*				
12:15	**LUNCH**	**LUNCH**	**LUNCH**			
14:00	**Superconducting magnets** lecture - *M. Wilson*	**Superconducting magnets** lecture - *M. Wilson*	**Mini-workshop Superconducting Magnets** *P. Lebrun* *D. Schoerling*			
15:00	**Superconducting magnets** lecture - *M. Wilson*	**Normal Conducting magnets** lecture - *T. Zickler*				
16:00 16:15	**Coffee Break**	**Coffee Break**	**Coffee Break**			
	Normal Conducting magnets lecture - *T. Zickler*	**Normal Conducting magnets** lecture - *T. Zickler*	*M. Wilson*			
17:15	**Normal Conducting magnets** lecture - *T. Zickler*	**Normal Conducting magnets** lecture - *T. Zickler*		**Visit CTF3 complex** ***Bus leaves at 19:30 from CERN***		17:30
18:15					19:30	

RF

Magnets

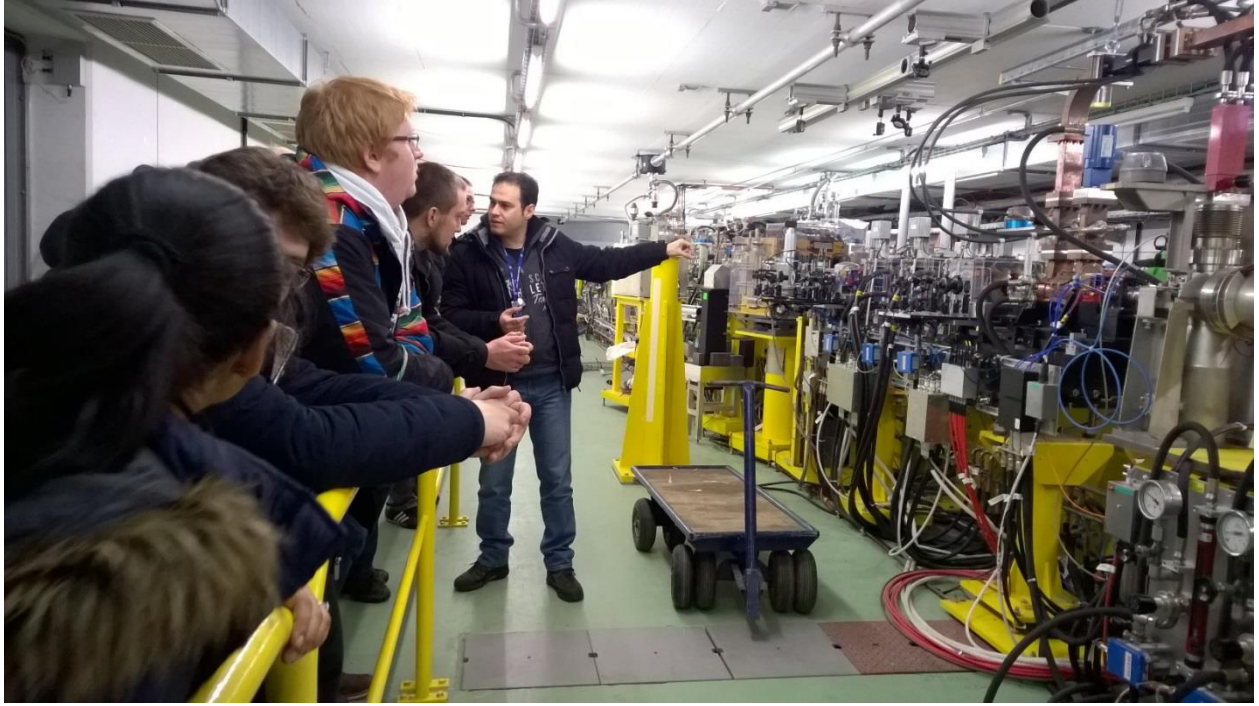
JUAS students during the practical days at CERN



Vacuum

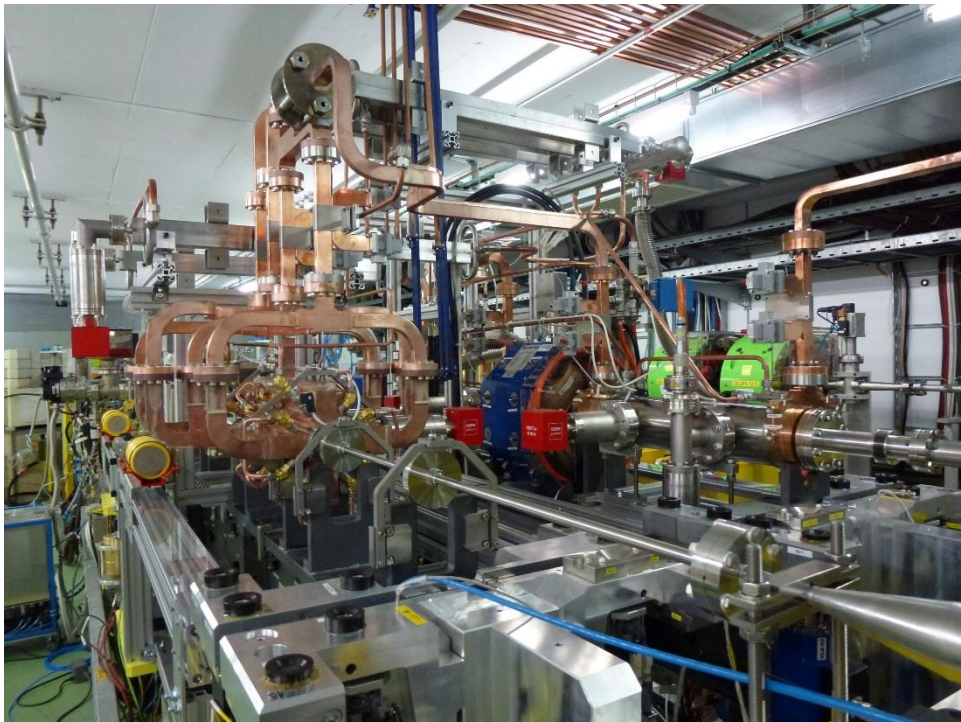
Super

conductivity



CTF3

Two Beam Test Stand



CTF3 = CLIC Test Facility 3

WEEK 8

	Monday Feb 29th	Tuesday March 1st	Wednesday March 2nd	Thursday March 3rd	Friday March 4th	
09:00	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** tutorial *P. Forck*	***Bus leaves at 8:00 from JUAS***	**VISIT** **AT** **PSI**	09:00
10:00 10:15	**Coffee Break**	**Coffee Break**	**Coffee Break**			10:00 10:15
	Beam instrumentation lecture *P. Forck*	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** tutorial *P. Forck*	*(Travel to Villigen)*		
11:15	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** lecture *P. Forck*	**Beam instrumentation** lecture *P. Forck*	***(Lunch at PSI)***		11:15
12:15	**LUNCH**	**LUNCH**	**LUNCH**	**VISIT** **AT** **PSI**	***(Lunch at PSI)***	12:15
14:00	**Beam instrumentation** tutorial *P. Forck*	**Superconducting RF Cavities** lecture *F. Caspers*	**Superconducting RF Cavities** tutorial *F. Caspers*		**VISIT** **AT** **PSI**	14:00
15:00	**Beam instrumentation** tutorial *P. Forck*	**Superconducting RF Cavities** lecture *F. Caspers*	**Superconducting RF Cavities** tutorial *F. Caspers*	**Accel. for hadron therapy** Seminar *M. Schippers*		15:00
16:00 16:15	**Coffee Break**	**Coffee Break**	**Coffee Break**			16:00
	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*		
17:15		**Performance & technology challenges of the LHC** Seminar *P. Lebrun*		***(Dinner at PSI)***	***Bus leaves at 17:30 from PSI***	17:00

WEEK 9

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

EXAMINATION

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It is a written examination

Each student who gets an **average mark of 10/20** (or above) will receive **ECTS(*)** recognized by the Universities. The number of ECTS credited is decided by the university and can vary.

There are 5 topics, each of them lasts one and half hour:

* Beam instrumentation
* Magnets
* RF engineering

* The remaining 2 exams are announced in week 9 (i.e. the week before the exams)

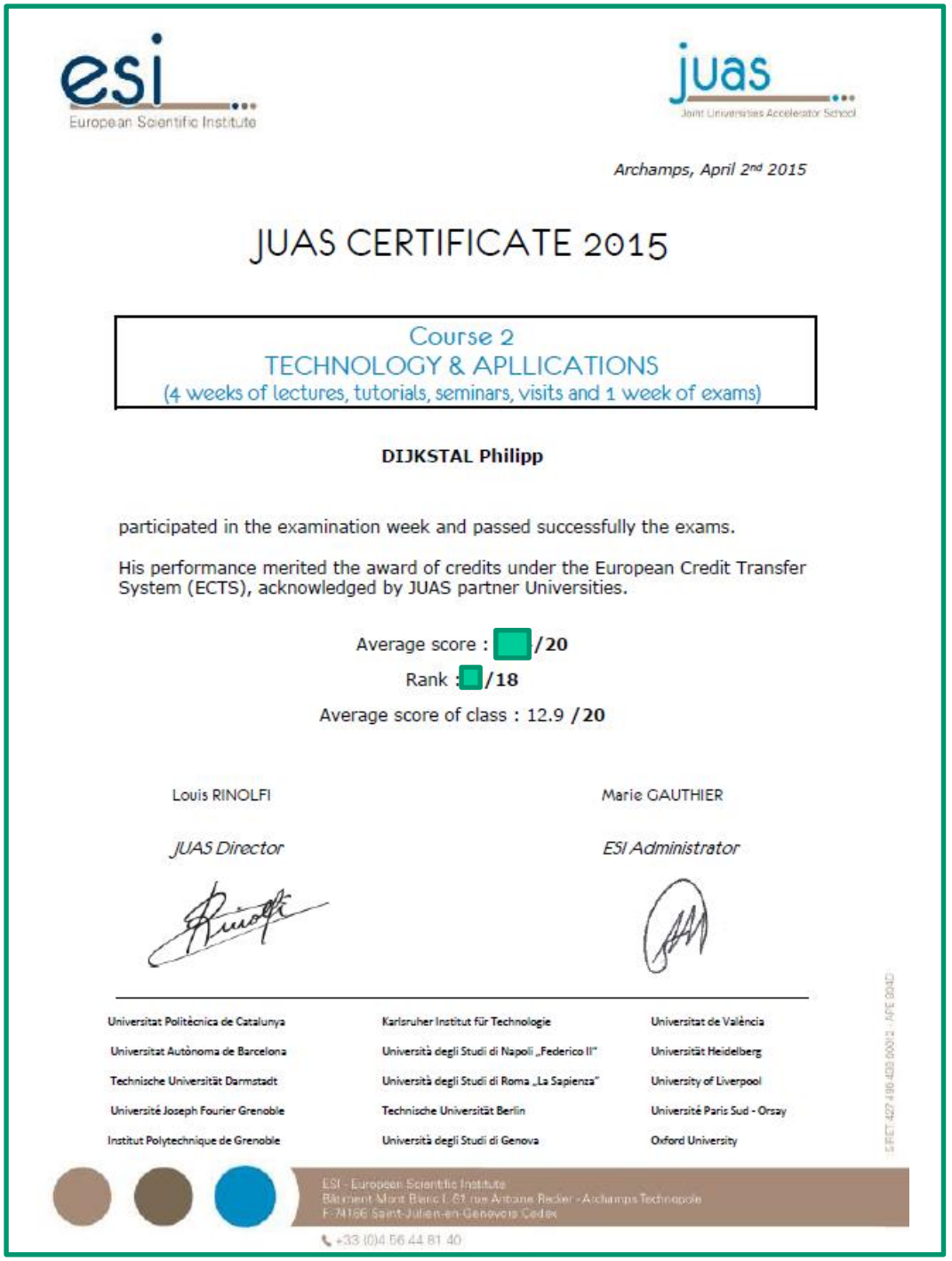
For each examination, all **written documents are permitted** as well as a pocket calculator.

It is strictly forbidden to have an electronic device (iPhone, Portable, etc…) during the exam

(*) ECTS = European Credit Transfer System

WEEK 10

	Monday March 14th	Tuesday March 15th	Wednesday March 16th	Thursday March 17th	Friday March 18th	
09:00						09:00
	Preparation of Examination	**EXAMINATION** **Beam Instrumentation** *Written session*	**EXAMINATION** **Magnets** *Written session*	**EXAMINATION** **RF** *Written session*	**Space Projects** Seminar *Isabelle Rongier* **Organized by ESIPAP**	
10:30	**Coffee Break**	**Coffee Break**	**Coffee Break**	**Coffee Break**	**Coffee Break**	10:30
11:00	**Preparation of Examination**	**EXAMINATION** *Topic given in week 9* *Written session*	**EXAMINATION** *Topic given in week 9* *Written session*	**DISCUSSION** **SUMMARY of** **JUAS lectures**	**Space Projects** Seminar *Isabelle Rongier* **Organized by ESIPAP**	11:00
12:30	**LUNCH**	**LUNCH**	**LUNCH**	**CLOSING RECEPTION JUAS COURSE 2**	**CLOSING RECEPTION ESIPAP MODULE 2**	12:30
14:00	**Preparation of Examination**				**Space Projects** Seminar *Isabelle Rongier* **Organized by ESIPAP**	14:00
15:30	**Coffee Break**				**Coffee Break**	15:30
16:00						16:00



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Archamps, April 2nd 2015

JUAS CERTIFICATE 2015

Course 2
TECHNOLOGY & APLLICATIONS
(4 weeks of lectures, tutorials, seminars, visits and 1 week of exams)

DIJKSTAL Philipp

participated in the examination week and passed successfully the exams.

His performance merited the award of credits under the European Credit Transfer System (ECTS), acknowledged by JUAS partner Universities.

Average score : **/20**

Rank : **/18**

Average score of class : 12.9 **/20**

Louis RINOLFI
JUAS Director

Marie GAUTHIER
ESI Administrator

Universitat Politècnica de Catalunya	Karlsruher Institut für Technologie	Universitat de València
Universitat Autònoma de Barcelona	Università degli Studi di Napoli „Federico II"	Universität Heidelberg
Technische Universität Darmstadt	Università degli Studi di Roma „La Sapienza"	University of Liverpool
Université Joseph Fourier Grenoble	Technische Universität Berlin	Université Paris Sud - Orsay
Institut Polytechnique de Grenoble	Università degli Studi di Genova	Oxford University

ESI - European Scientific Institute
Bâtiment Mont Blanc I, 61 rue Antoine Redier - Archamps Technopole
F-74166 Saint-Julien-en-Genevois Cedex
+33 (0)4 56 44 81 40

JUAS certificate of examination for course 2

Each student who obtains a mark equal (or above) to 10 / 20 will receive such certificate

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Joint Universities Accelerator School 2015

Archamps, 02nd April 2015

CERTIFICATE OF ATTENDANCE

We, undersigned, certify that,

DIJKSTAL Philipp

has registered as student for JUAS 2015 and
has followed 4 weeks of JUAS courses (lectures, tutorials, seminars and visits),

Technology & Applications of Particle Accelerators

(Course 2)
(from February 16th to March 13th in Archamps -France)

This course consists of RF Engineering, Vacuum Systems, Electromagnetism, Normal Conducting Magnets, Superconducting Magnets, Superconducting RF Cavities, Beam Instrumentation, Particles Sources, Accelerator Control, Low Energy Electron Accelerators, Accelerators for Industrial & Medical Applications, High Current Proton Linac, Particle therapy and accelerators, Radiation safety.

*Organized by the European Scientific Institute (E.S.I.) in partnership with 15 European Universities.**

Louis RINOLFI
JUAS Director

Marie GAUTHIER
ESI Administrator

JUAS certificate of attendance for course 2

Each student who followed more than 90% of the course will receive such certificate

Job opportunities from JUAS

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Being at JUAS is THE opportunity to find a position for:

- an internship or traineeship in European and International Laboratories,
- a summer job,
- a PhD grant,

other job opportunities.

-talk to the lecturers, question them during the coffee breaks, lunch time,….

-talk to people you'll meet during the various Laboratory visits.

-we keep updated the JUAS web site with job/traineeship/PhD/post announcements:

see the link Job opportunities

Accelerator Conference prize for JUAS

JUAS is allotted a grant by IPAC Committee: **International Particle Accelerator Conference**

The requirements to receive the grant and to attend IPAC Conferences are the following:

1. To follow completely JUAS courses
2. To obtain the best marks at the examination and write good reports
3. To continue in the field of particle accelerator
4. To be proposed by JUAS Director to IPAC Conference Coordinator
5. To present work at the conference, abstract/poster and contribution to proceedings
6. To serve as required, scientific secretary, etc. as for other supported students

IPAC 2016

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Busan, South Korea

8th – 13th May 2016

http://www.ipac16.org/general/index.html

JUAS – Photo

JUAS 2016 – Course 1
Science & Physics of Particle Accelerator

Last but not least …

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ARRIVE ON TIME AT THE LECTURES

It means, manage to be installed 5 minutes ahead of schedule

"Can we speed this up? I'm in a hurry."

I wish you a

pleasant stay at

JUAS 2016