The ARIES Massive Online Open Course

CERN, 3rd May 2022

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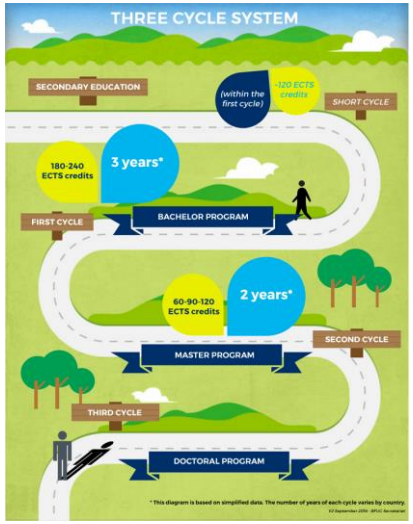
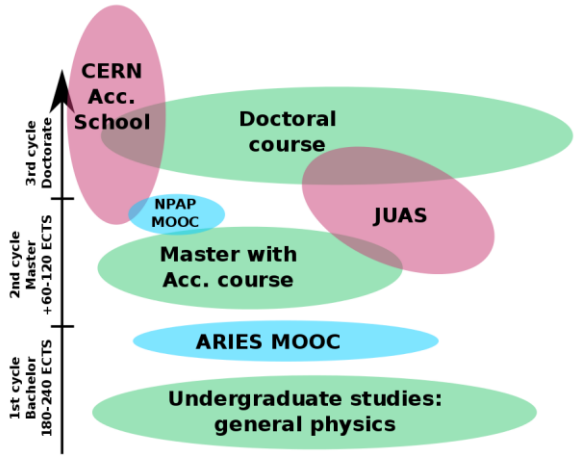
Motivations - Reminder

- This Massive Open Online Course aims at raising awareness on Accelerator Science and Technology.
- It is aimed at 3rd year students (end of the 1st cycle – before the master).
- So its target audience is younger than that of JUAS and CAS.
- It can also help train young professionals joining the field.





Goals and deliverables

Task 2.4. Provide an e-learning course: introduction to accelerator science, engineering and technology

- Survey existing e-learning initiatives in relevant physical sciences disciplines.
- Define the intellectual content of the e-learning course.
- Survey e-learning tools and select an appropriate tool.
- Set up the e-learning course in test mode.
- Define resources required to launch, maintain and run the course on a sustainable basis.

Milestone	**Month 12**	**Meeting to agree MOOC platform and academic structure and content of e-learning course.**
Deliverable	Month 36	e-learning course delivered in test mode, ready for use.

Define the content of the e-learning course.

- The course will be split in two parts:
  - An Introductory part of 4 hours
    - Introduction to accelerators (Coordinated by Philippe Lebrun)
    - Electromagnetism with no pre-requisites (Coordinated by Vittorio Vaccaro)
    - Special Relativity with no pre-requisites (Coordinated by Elias Metral)
    - Applications of accelerators (Coordinated by Angeles Faus Golfe)
  - An advanced part with 3 modules of 6 hours
    - Accelerator physics
    - Accelerator Engineering
      - RF (Coordinated by Graeme Burt)
      - Magnets (Alex Bainbridge)
    - Applications of accelerators
- ***See presentation at ARIES' Budapest meeting and IPAC'18 Paper on the ARIES MOOC.***

WP 2.4 Milestone

Survey [and] select an appropriate tool

- A technical committee had been setup to survey e-learning tools and select the most appropriate.
- The MOOC will be released on a international platform.
- As these platform require a full course, the test mode will be on You Tube.
- The recordings are released with an open license (Creative Commons) so that any University or organisation can use the MOOC internally if it wishes so.
- The language is English but any country or language group is welcome to translate it (or add sub-titles) if it wishes so.
- More details in IPAC'18 paper.

Set up the e-learning course in test mode

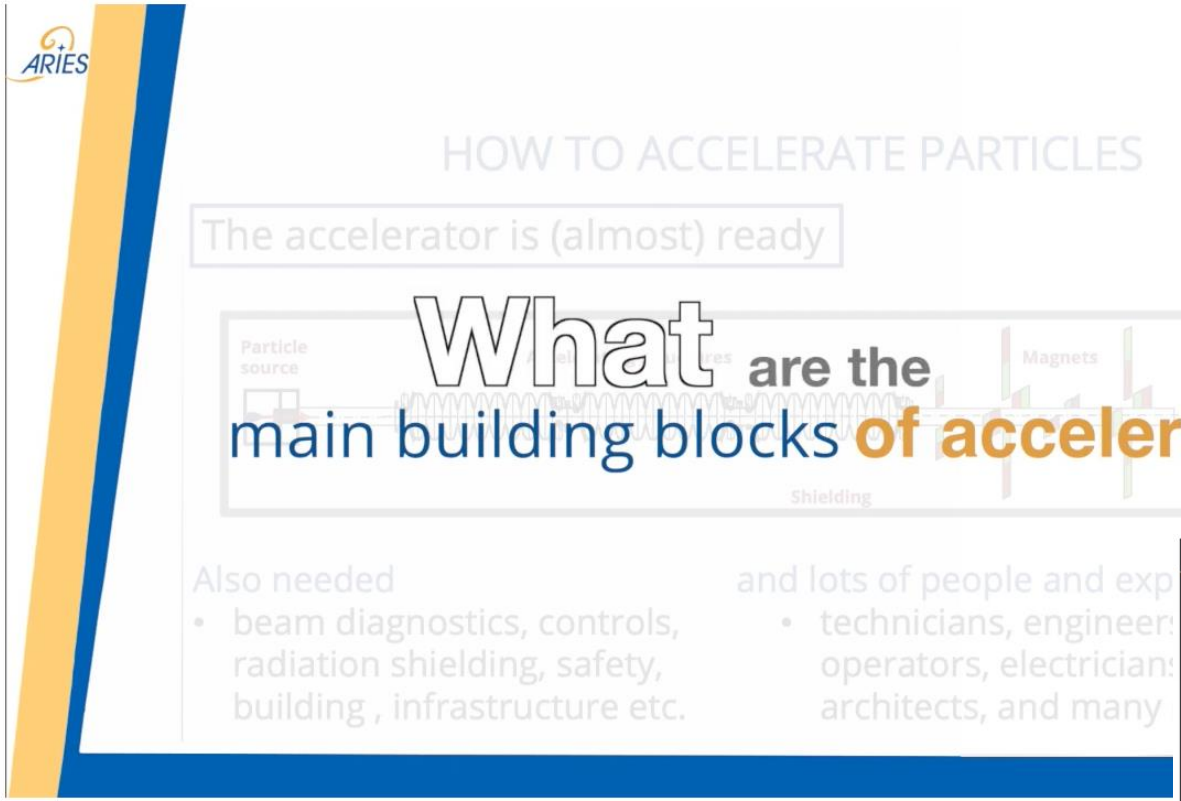
- Five lectures have been fully produced:
  - Introductory
    - Introduction to accelerators (Coordinated by Philippe Lebrun)
    - Electromagnetism with no pre-requisites (Coordinated by Vittorio Vaccaro)
    - Special Relativity with no pre-requisites (Coordinated by Elias Metral)
    - Applications of accelerators (Coordinated by Angeles Faus Golfe)
  - Accelerator Engineering
    - RF (Coordinated by Graeme Burt)
- All these lectures are available at http://mooc.particle-accelerators.eu/
- One lecture is recorded and in post-processing phase:
  - Magnets (Alex Bainbridge)

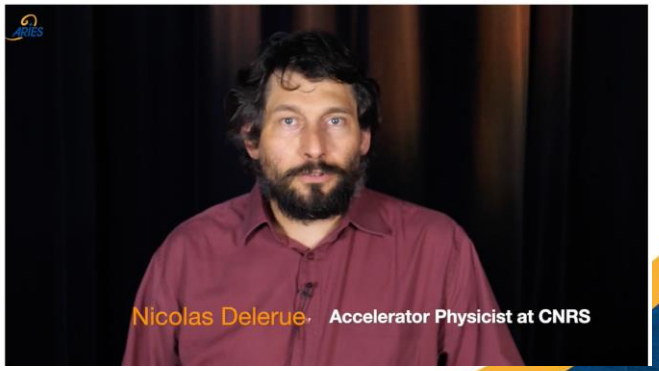
Lecturers diversity

- Special attention was paid to lecturers diversity:
  - 11 men and 7 women
  - Different career stage
  - Different labs and universities
  - 6 different countries

Teaser

- http://mooc.particle-accelerators.eu/teaser/

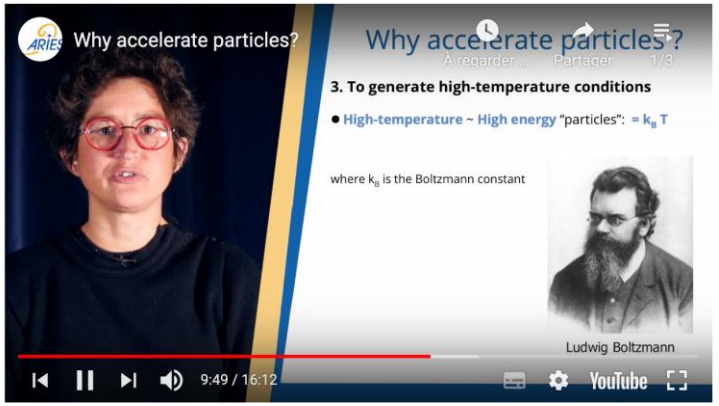




Introduction to accelerators

- http://mooc.particle-accelerators.eu/introduction-to-particle-accelerators/

Philippe Lebrun (CERN)



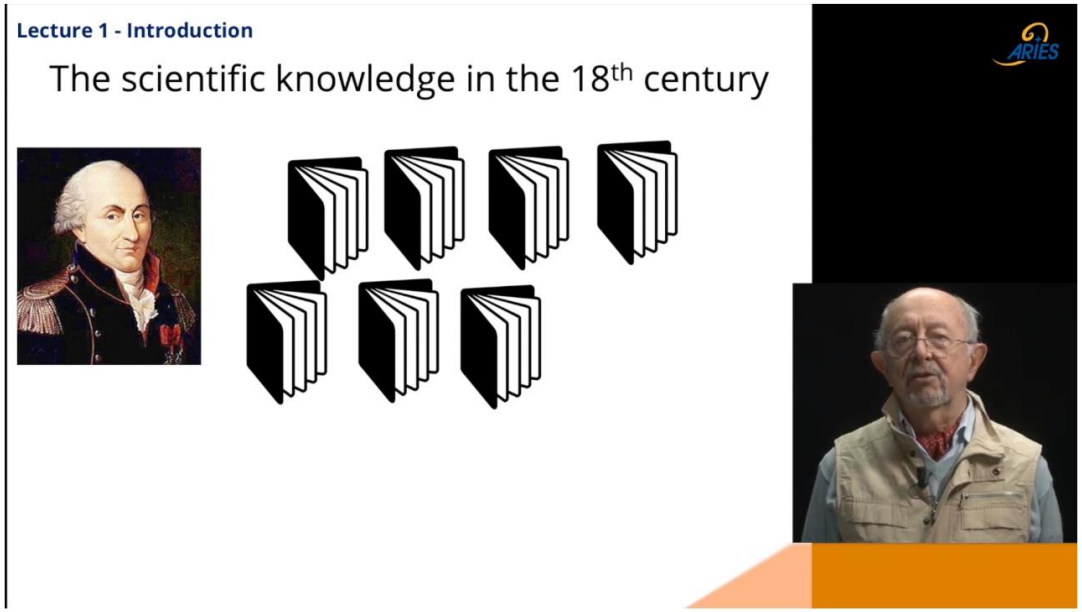
Marie Labat (SOLEIL)

Nicoleta Baboi (DESY)

Simona Bettoni (PSI)

Electromanetism

- http://mooc.particle-accelerators.eu/electromagnetism/

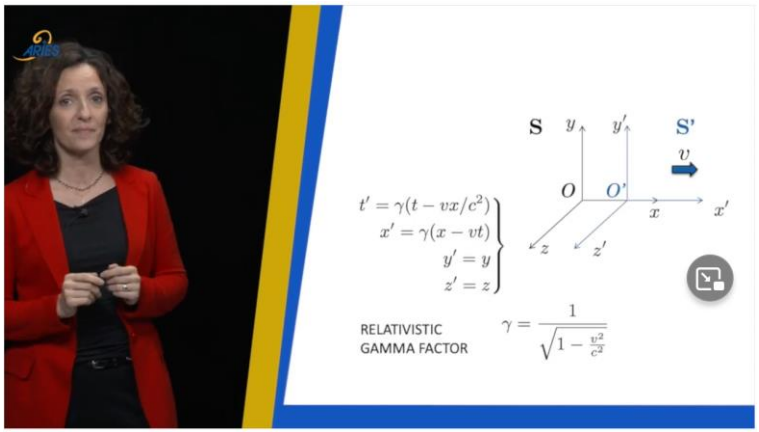


Vittorio Vaccaro (INFN)

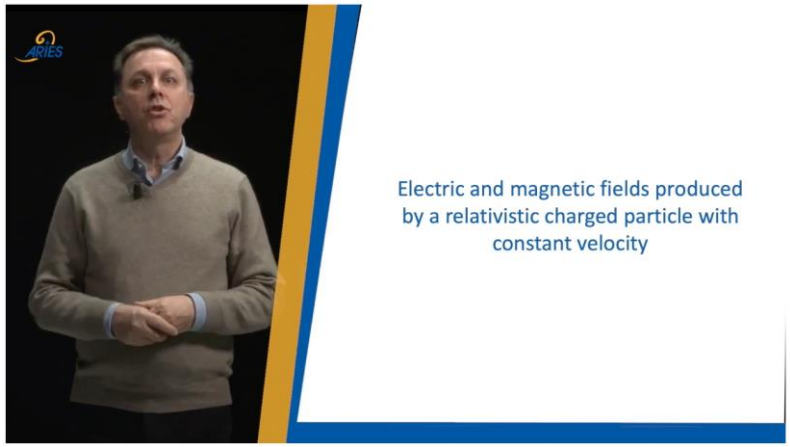
Special Relativity

- http://mooc.particle-accelerators.eu/special-relativity/

Elias Metral (CERN)



Tatiana Pieloni (EPFL)



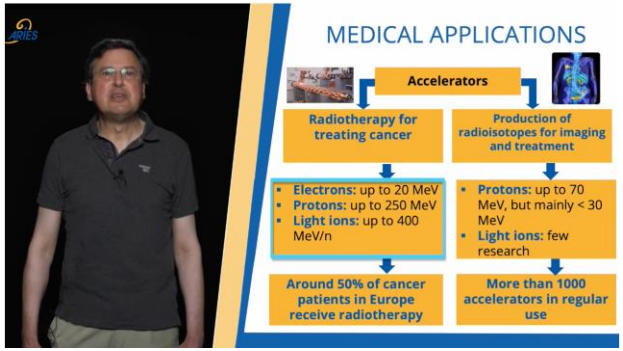
Mauro Migliorati (La Sapienza)

Applications

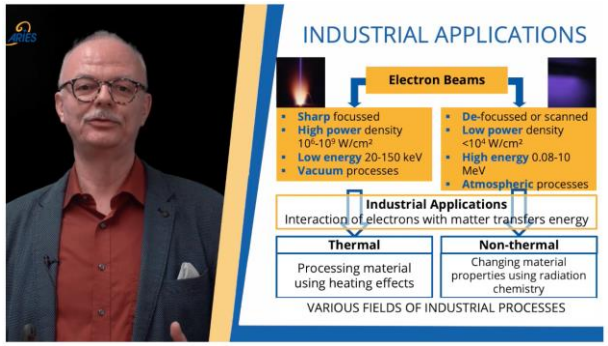
- http://mooc.particle-accelerators.eu/applications-of-particle-accelerators/

Angeles Faus-Golfe (CNRS)

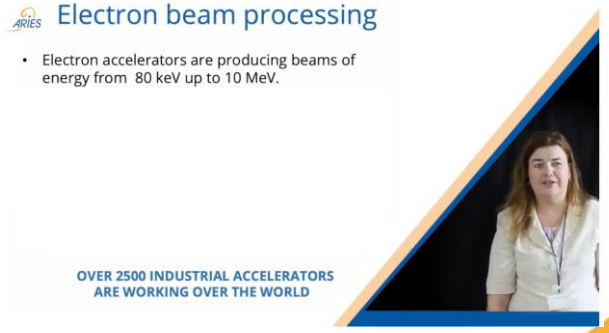
Mike Seidel (PSI)



Rob Edgecock
(U. of Huddersfield)



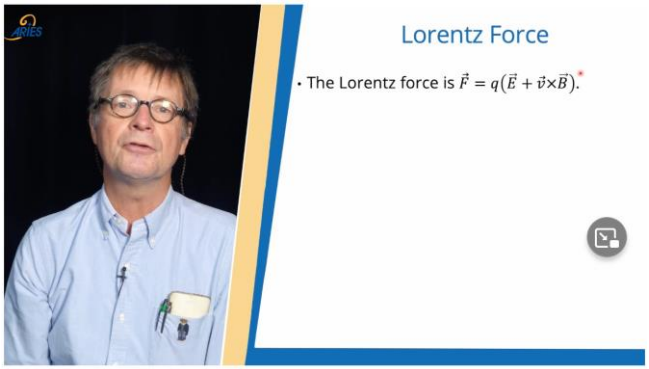
Frank Holm Roegner
(Fraunhofer Institute)



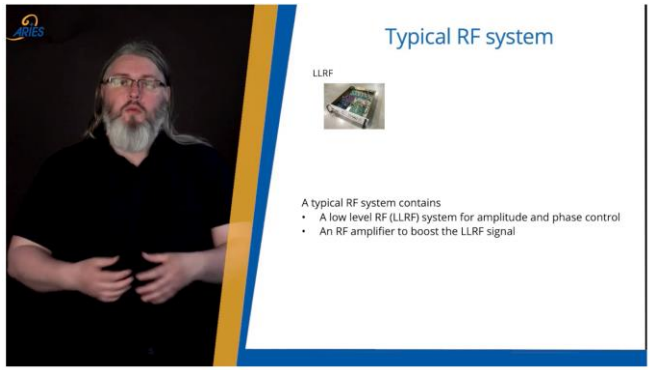
Dagmara Smietanko
(INCT, Warsaw)

RF for Accelerators

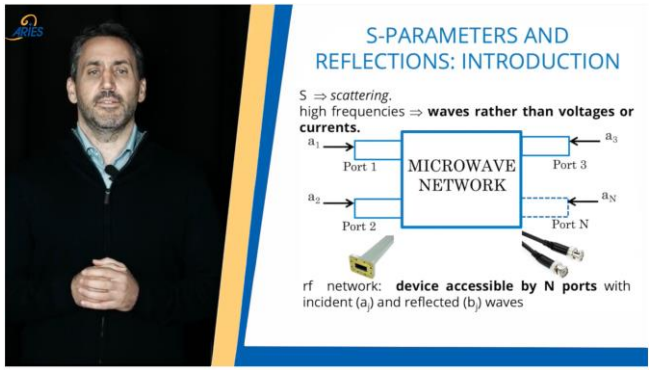
- http://mooc.particle-accelerators.eu/radiofrequencies-for-particle-accelerators/



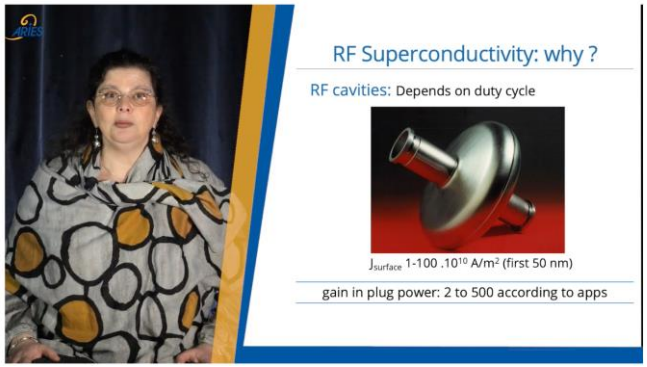
Erk Jensen (CERN)



Graeme Burt (Lancaster)



David Alesini (INFN)



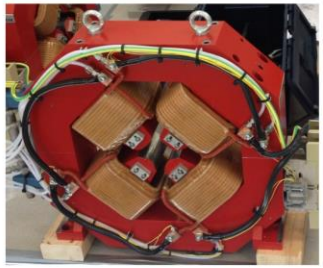
Claire Antoine (CEA)

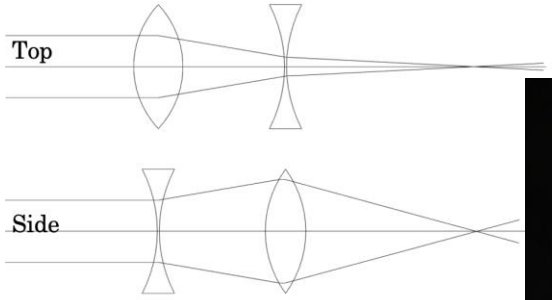
Magnets

- Post processing in progress

Quadrupole magnets

Quadrupoles are magnets with 4 poles, 2 north and 2 south. They can be used to focus particle beams down to a sharp point, or make them diverge. They are vital for controlling the natural divergence of the beam.





Alex Bainbridge (STFC)

MOOC engineering

- Video recording:
  - Université Paris-Saclay
  - CERN Video studio
  - Other external contractor
- And because of the pandemics, some video were self recorded with the remote help of an engineer to check video and sound quality.
- The MOOC post-processing was done by Aurelie Rousseau and Hugues Cazin from Université Paris-Saclay

Administrative issues

- Large turnover of administrative staff in charge of the contract management delayed the project, especially procurement.
- Some colleagues had their travel expenditures reimbursement delayed by more than a year (I am very sorry for that).
- Due to new internal rules, most indirect costs (~60k€) were not available for the project and will only become available two years after the end of the project…

Define resources required…

- *Define resources required to launch, maintain and run the course on a sustainable basis*
- Cost of the MOOC so far:
  - ~30k€ for 5 hours => ~6k€/hours
  - Large variation of the cost depending on the lecture (travel, recording mode, post-processing,…)
- To *launch the MOOC* with 10 lectures would require 3-4 additional lectures at a total cost of 24k€ (well within indirect costs if they become available).
- Some coordination with the Nordic MOOC could give access to more lectures at very little cost.
- To *maintain and run the course* requires someone to operate a forum, answering question of the participants. Could probably be done on a part-time basis by a graduate student (cost 1-2k€/year).
- *Sustainable basis:* The MOOC will be sustainable if it is used by the community. JUAS is already using some lectures as pre-requisite.

Outlook

- The ARIES MOOC is available in test mode at http://mooc.particle-accelerators.eu/
- It is complementary to JUAS and CAS and universities Graduate training in accelerators.
- JUAS is already using some lectures as pre-requisite.
- Hopefully some lectures will be added once indirect costs are released (Magnets, Beam diagnostics, Beam dynamics,…).
- All lectures are released on Creative Commons license to make them freely available.
- This MOOC will be sustainable if it is used by the community. Is it useful to give some insight of accelerator physics to incoming graduate students or interns? To new staff joining the field? What need to be added? Language issues?
- Please try it and send me your feedback…

Thank you

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