Introductory Course on Accelerator Physics

Budapest, 2-14 October, 2016

Introduction to tutorial
Basic idea: Put the course material into practice

Traditional style in previous schools:

- Work on a specific problem with a specific solution, this often leads to some attitude towards the exercise:
  - "I know the formulae, I just have to figure out how to put them in the problem"
  - "I’ve always done it that way and I was successful (i.e. it works in examinations)"

- You will not always do it that way, in your job you will flunk

- The problems always come in the context of a larger undertaking, not as isolated bits

- Understanding the concept, even at high level, does not ensure that it can be applied in an appropriate manner
We (CAS Programme Committee) decided to try a new strategy:

- Should be closer to everyday working practice than traditional tutorials.
- Work in small groups on an "Accelerator Project", as a "Real World Scenario"
- This style of working is increasingly used by universities (same reasoning as above)
- Should encourage to be critical and decision making
- The exercise and some hints provided by the handout
Exercise:
Develop a conceptual design for a particle accelerator complex (for particle physics) with the following features:

- Centre of mass energy 50 TeV
- Desired Luminosity: \( L \approx 10^{35} \text{ cm}^{-2} \text{ s}^{-1} \)
- Maximum magnetic field for any type of magnet 10 T
- Maximum length of the machine must not exceed 100 km
- Maximum beam energy 1 GJ
- Relative momentum spread smaller than \( \frac{\Delta p}{p} \leq 1.0 \cdot 10^{-4} \)
- To avoid significant loss of luminosity and time resolution, the bunch length should not exceed 0.1 m
- Develop some ideas for the required injector chain
Working style:

- No unique solution: some creativity and initiative needed!
- Working in a small group (6-7 people, see later)
- Each group has a tutor assigned to serve as facilitator and guide, will be available day and night..
- Discussions and interactions with lecturers highly encouraged (and needed!)
- Use the scheduled discussion sessions
- Tutorial sessions (2) interleaved during the school to discuss in larger groups and with a tutor to get help to sort out upcoming problems.
- For final tutorial: groups should prepare a short (10’) summary of their proposal
What should be the outcome:

- Concept for a proposal with a realistic parameter set
- Discuss and propose an injector chain

What should not be the outcome:

- Full design of the machine(s)