



Particle Physics Online Course for High-School Students

20th IPPOG meeting

2 December 2020

Particle Physics Course for High-School Students

Motivation: high demand for educational offers targeting high-school students

- Goals:**
- develop online learning offer for high-school students from around the world
 - provide teachers with educational ideas and materials for their classroom
 - narrow the research-practice gap in particle physics education research



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Target group: high-school students (14-19 years)

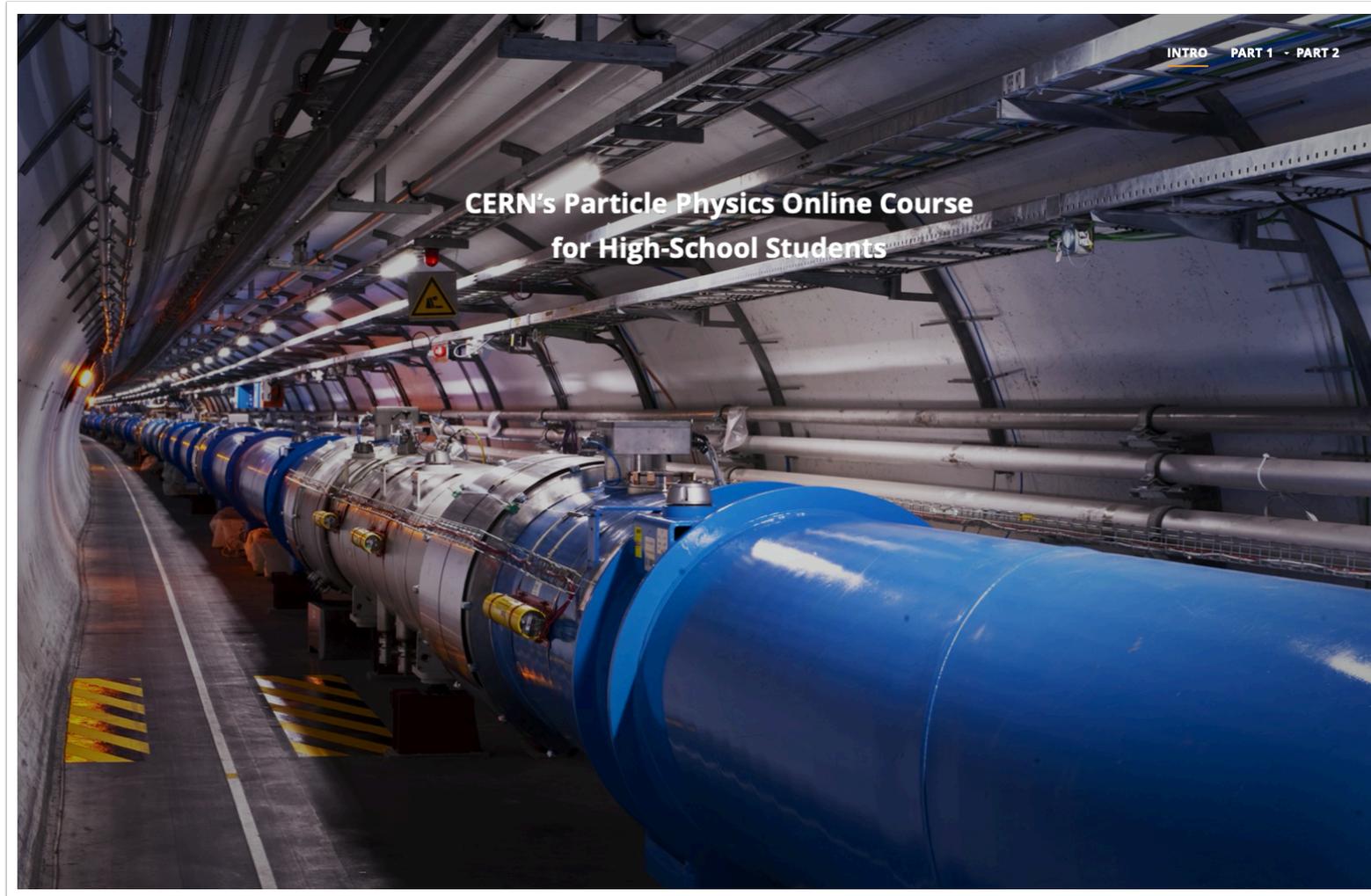
Aim: introducing students to central models of particle physics

Course: 16 chapters comprising videos/transcripts and quiz questions

Structure: key messages and experiments/activities

Part 1		Part 2	
1 What is a particle?	5 What are interactions?	9 What is antimatter?	13 What is a particle accelerator?
2 What is a model?	6 What is matter?	10 What is the SMPP?	14 What is a particle detector?
3 What is particle physics?	7 What are conservation laws?	11 What is the Higgs boson?	15 What is a cloud chamber?
4 What are charges?	8 What are particle transformations?	12 What is beyond the SMPP?	16 What is CERN?

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INTRO **PART 1** - PART 2

CHAPTER 1

What is a Particle?



We will start with the most difficult question right at the beginning. It is the one question, we scientists here at CERN are most afraid of because it is so difficult to give a correct answer to it. The question is, "What is a particle?". This is really a tough one, because, to be honest, we do not know. Do not get me wrong – we do have a good idea about what we mean by describing something as a particle. But what a particle really "is", we do not know. If you were to ask different physicists from around the world, they would all give you a definition of what they think a particle is. You would probably hear a variety of different models and descriptions of particles. But nobody would be able to tell you what a particle "is"! [Indeed, this is the first important message of this chapter. We do not know what a particle is.](#)

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Part 1

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Part 2

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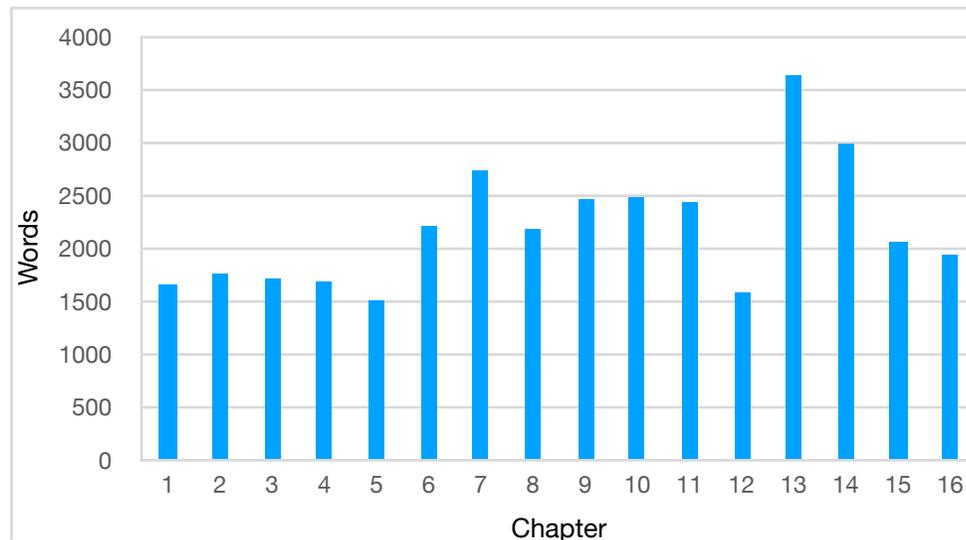
12 What is beyond the SMPP?

13 What is a particle accelerator?

14 What is a particle detector?

15 What is a cloud chamber?

16 What is CERN?



- Videos lasting between 10-25 minutes
- Each chapter ends with 4-6 quiz questions

Total course duration: 4-5 hours

Next steps

Complete initial version with 16 chapters and 80 quiz questions early next year

Perform design-based research to further develop individual chapters

Transform quiz questions into a Research-Based Assessment Instrument (RBAI)



Long-term planning

Create different language versions

Add additional chapters and different levels

Use the course as application step for residential student programmes at CERN

Merci bien!

Questions?



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