

# What's next?

Danish Teacher Programme

30 September 2022







Share your experience with your students, your colleagues, and the general public.





Share your experience with your students, your colleagues, and the general public.

Act as ambassadors for science/engineering and in particular for particle physics.





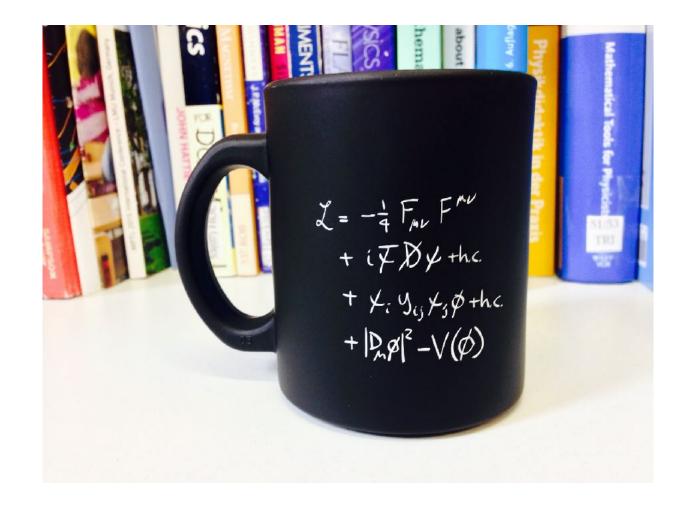
Share your experience with your students, your colleagues, and the general public.

Act as ambassadors for science/engineering and in particular for particle physics.

Organise follow-up activities.









OPEN ACCESS Phys. Educ. 52 (2017) 034001 (9pp)

### Phys.Educ. 52 (2017) 034001 (9pp) Let's have a coffee with the

PAPER

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### Standard Model of particle physics!

Julia Woithe<sup>1,2</sup>, Gerfried J Wiener<sup>1,3</sup> and Frederik F Van der Veken<sup>1</sup>

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### Abstract

The Standard Model of particle physics is one of the most successful theories in physics and describes the fundamental interactions between elementary particles. It is encoded in a compact description, the so-called 'Lagrangian', which even fits on t-shirts and coffee mugs. This mathematical formulation, however, is complex and only rarely makes it into the physics classroom. Therefore, to support high school teachers in their challenging endeavour of introducing particle physics in the classroom, we provide a qualitative explanation of the terms of the Lagrangian and discuss their interpretation based on associated Feynman diagrams.

1. Introduction The Standard Model of particle physics is the most important achievement of high energy physics to date. This highly elegant theory sorts elementary particles according to their respective charges and describes how they interact through fundamental interactions. In this context, a charge is a property of an elementary particle that defines the fundamental interaction by which it is influenced. We then say that the corresponding interaction particle with the strong interaction particles of the strong interaction particles of the strong interaction course to course charge the strong interaction. Course Course and the strong interaction of the four Description of Distribution 3.0 licence. Any further distribution of this work must maintain attribution to the athor(s) and the tile of the work, journal citation and Dic.	i F e a a t s s s s s s s f ( I I c	Intradmental interactions in nature, all except grav- ity are described by the Standard Model of particle hydroises: particles with an electric charge are influ- enced by the electromagnetic interaction (quantum electrodynamics, or QED for short), particles with a weak charge are influenced by the weak inter- action (quantum flavour dynamics or QFD), and hose with a colour charge are influenced by the strong interaction (quantum chromodynamics or QCD). Contrary to the fundamental interactions, the Brout-Englert-Higgs (BEH) field acts in a special aw.3 Because it is a scalar field, it induces spontaneous symmetry-breaking, which in turn gives mass to all particles with which in interact this is commonly called the Higgs mechanism). In addition, the Higgs particle (H) couples to any betre particle which has mass (including itself). Interactions are mediated by their respec- tive interaction particles: photons ( $\gamma$ ) for the
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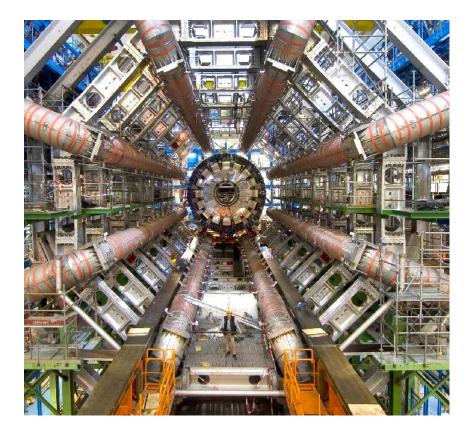
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The Standard Model of particle physics is the most important achievement of high energy physics to date. This highly elegant theory sorts elementary particles according to their respective charges and describes how they interact through fundamental interactions. In this context, a charge is a property of an elementary particle that defines the funda- mental interaction by which it is influenced. We then say that the corresponding interaction particle 'couples' to a certain charge. For example, gluons, the interaction particles of the strong interaction, couple to colour-charged particles. Of the four <b>Descent</b> Original content from this work may be during the submers of the Creative Commons Attribution 3.0 licence. Any further distri- bution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.		ity are described by the Standard Model of particle physics: particles with an electric charge are influ- enced by the electromagnetic interaction (quantum electrodynamics, or QED for short), particles with a weak charge are influenced by the weak inter- action (quantum flavour dynamics or QFD), and those with a colour dynamics or QFD), and those with a colour dynamics or QFD, and strong interaction (quantum chromodynamics or QCD). Contrary to the fundamental interactions, the Brout–Englert–Higgs (BEH) field acts in a special way. Because it is a scalar field, it induces spontaneous symmetry-breaking, which in turn gives mass to all particles with which it interacts (this is commonly called the Higgs mechanism). In addition, the Higgs particle (H) couples to any other particle which has mass (including itself). Interactions are mediated by their respec- tive interaction particles: photons ( $\gamma$ ) for the
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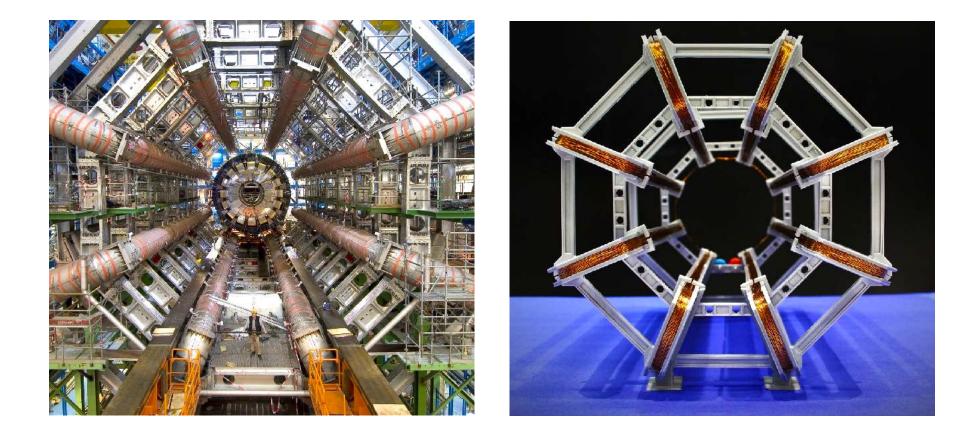




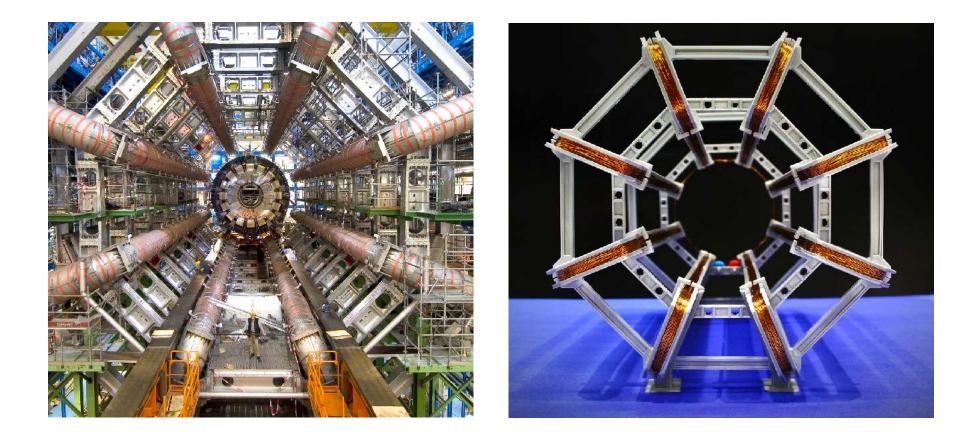












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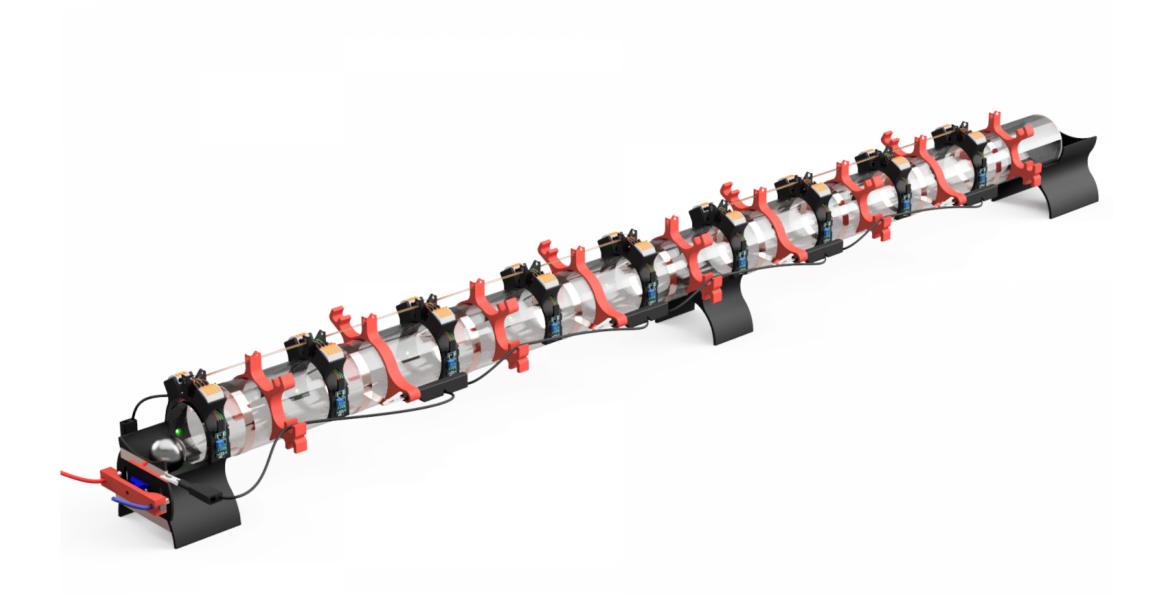




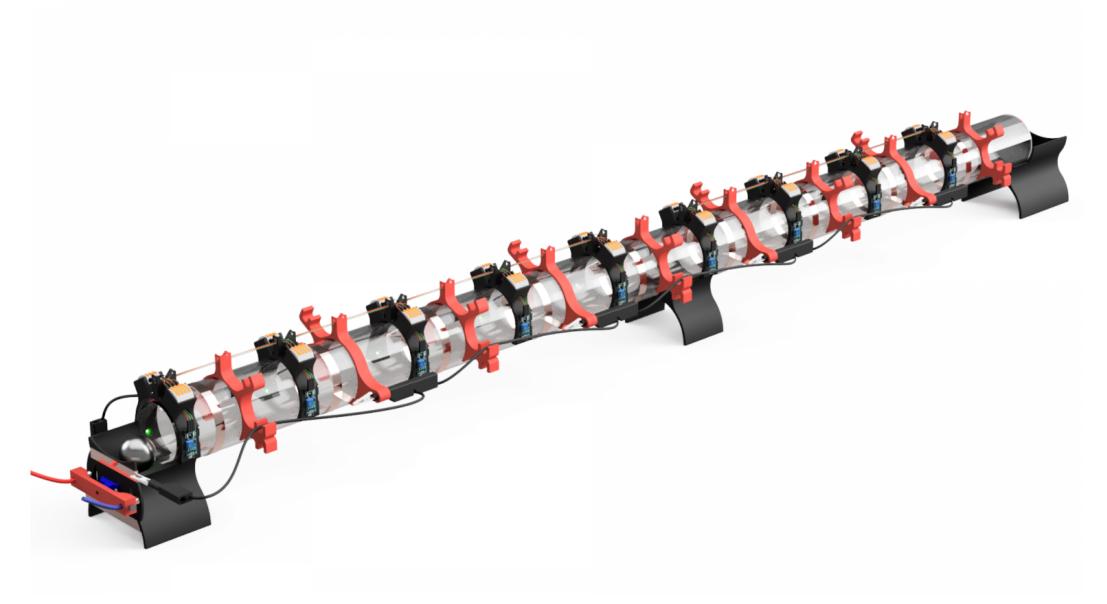


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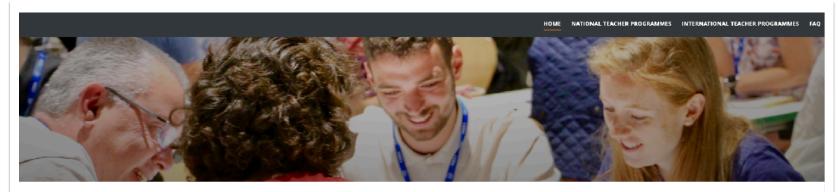






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### "There is nothing more enriching and gratifying than learning." [Fembles Glarett, CTEN Director-Genere]

Let  $\gamma$  year, CLRN off is various professional development programmes for teachers to keep up-to-date with the latest developments in particle physics and related areas, and experience dynamic, international research environment. All programmes are facilitated by experts in the field of physics, or gineering, and computing and include an extensive detext and with timerary.

Furthermore, CERK's teacher programmes enable you to meet with teaching colleagues from your country or from all around the world. We offer teacher programmes in either English or in one of the national languages of CHIM Member/States, lasting between 3 days and 2 weeks.



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International High School Teacher Programme 2-15 July 2023

International Teacher Weeks Programme 6-19 August 2023





# **International Teacher Programmes 2023**

International High School Teacher Programme 2-15 July 2023

### International Teacher Weeks Programme 6-19 August 2023



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