

Fisica ai Colliders /Collider Physics

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crediti: - *periodo/nizio:* /

1.- Introduction

- a.- A brief history of colliders and their impact on particle physics before the LHC.
- b.- The Standard Model in a nutshell
- c.- The BEH mechanism and its implications
- d.- Perturbative unitarity and the no-lose theorem
- e.- Where do we stand, what are the big questions?

2.- Elements of colliders

- a.- Elements of colliders electron-positron versus hadron
- b.- Hadron colliders: machine challenges
- c.- Hadron collider physics: kinematics and the collinear factorisation
- d.- Measurements of the luminosity and forward physics

3.- Elements of particle detectors and event reconstruction

- a.- Elements of detection techniques
- b.- LHC detectors
- c.- Triggering events
- d.- Reconstructing events
- e.- Simulating events at the LHC

4.- QCD at hadron colliders

- a.- Monte Carlo generators
- b.- Soft QCD measurements and tuning of Monte Carlo generators
- c.- Hard QCD measurements of jets and the running of α_S
- d.- Precision Vector boson production measurements
- e.- Interlude on electron-proton collisions and PDFs
- f.- PDFs at the LHC.

5.- Flavor Physics at the LHC

- a.- Summary of electron-positron B factories
- b.- Main CKM measurements at the LHC and the angle γ
- c.- CP violation in charm decays
- d.- Rare decays
- e.- Lepton Flavor Universality anomalies

5.- Precision EW measurements at the LHC

- a.- Measurement of the W mass
- b.- Measurements of the FB asymmetry at the LHC and the weak mixing angle. c.- Precision EW observables and fit of the Standard Model.
- d.- Challenges in Precision EW measurements.

6.- EW and top measurements at the LHC

- a.- Diboson and triboson measurements and implications.
- b.- Vector boson scattering (including longitudinal) at the LHC. c.- Challenges in multi boson measurements.
- d.- Top quark single and pair production measurements at the LHC e.- Top production charge asymmetry.
- f.- Top rare production processes.
- g.- Top quark mass measurements. h.- Challenges in top physics.

7.- Higgs physics

- a.- The discovery of the Higgs boson at the LHC
- b.- Higgs boson production measurements in diboson channels
- c.- Probing the couplings of the Higgs boson to fermions
- d.- Measurements of Higgs boson couplings at the LHC
- e.- Constraining the Higgs boson width at the LHC
- f.- New trends in Higgs physics
- g.- Challenges in Higgs physics at the LHC