

## Week 4 – February 15/17, 2022

### LHC and Hadron Collider Physics

#### Objectives

- Review history of particle accelerators
- Identify design and choice of magnets in accelerators and detectors
- Understand current state of upgrades in CERN's long-term plan
- Identify limitations of lepton vs hadron colliders, linear vs circular

No HW due Today Feb 15<sup>th</sup>

HW due Thursday Feb 17<sup>th</sup> by start of class:

- Arrange paper assignment via email (see feedback from last week)
- Describe, in as much detail as you can, the path of a proton: from hydrogen gas bottle to collision. Send via email.

HW due Tuesday Feb 22<sup>nd</sup>:

- Prepare 5-min presentation of your paper, send slides/outline/notes ahead of time via email

#### Class Outline

- What's a particle?
  - Classical vs QM vs QFT
  - Rutherford's gamma rays, plus the alphas and the betas
- Overview of particle accelerators
  - LINAC
  - Cyclotron -> Synchrotron
  - LHC Complex
- Magnets of the LHC
  - Bending
  - Focusing
- Long-term plans at CERN