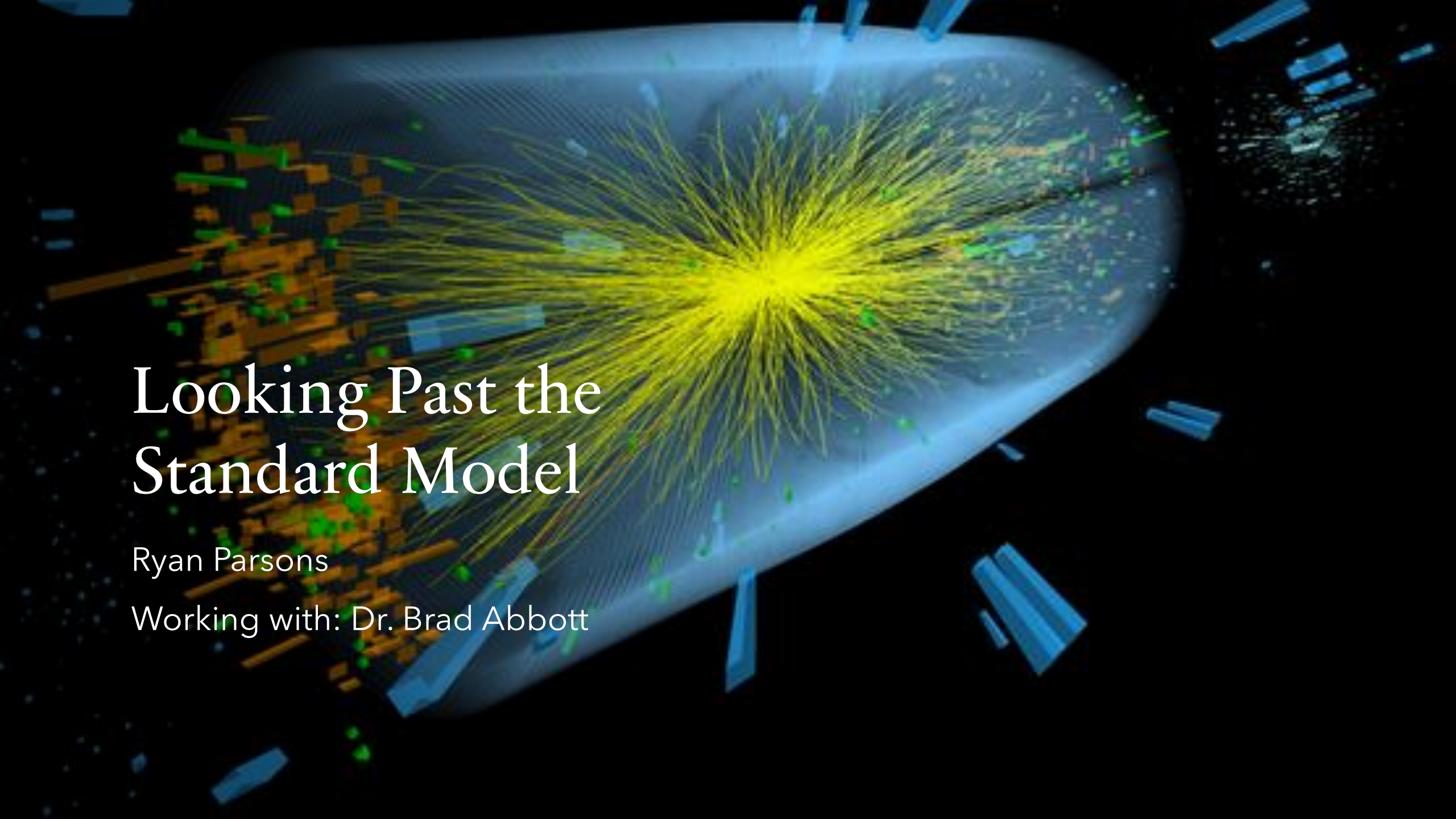


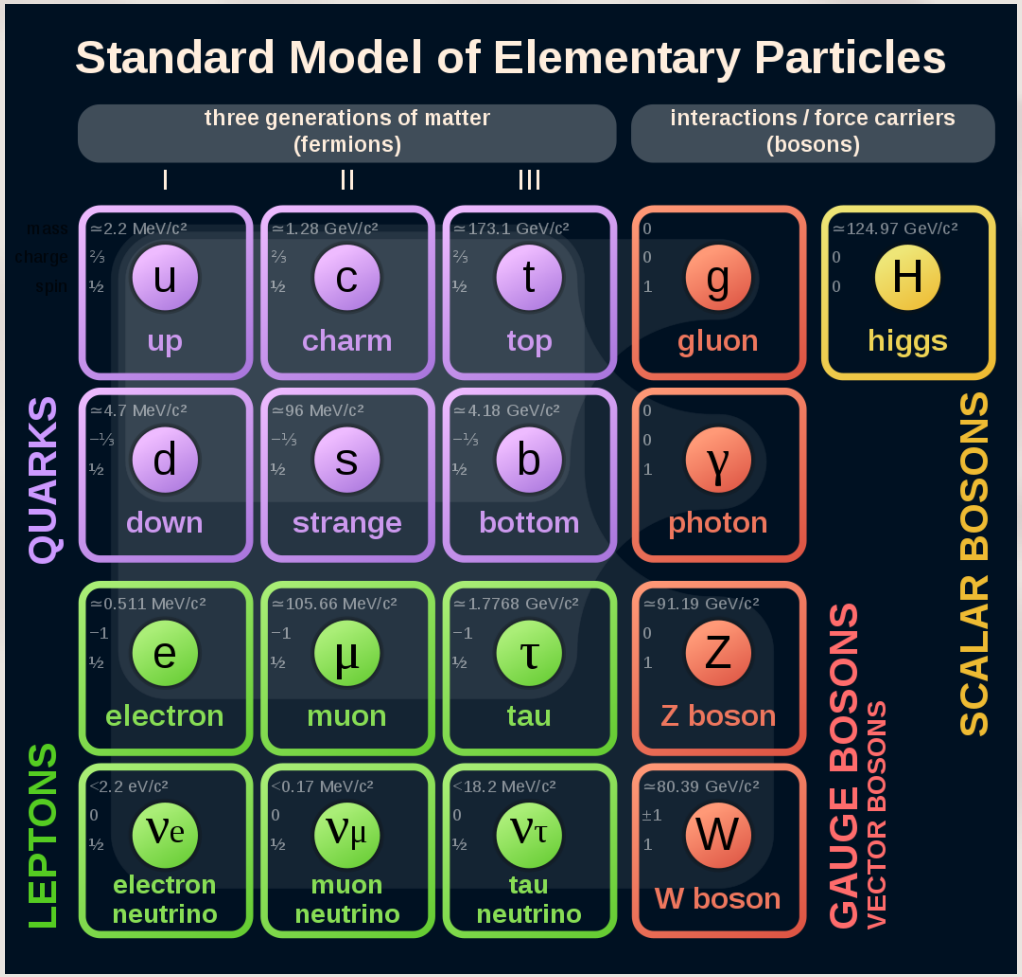
Looking Past the Standard Model

Ryan Parsons

Working with: Dr. Brad Abbott

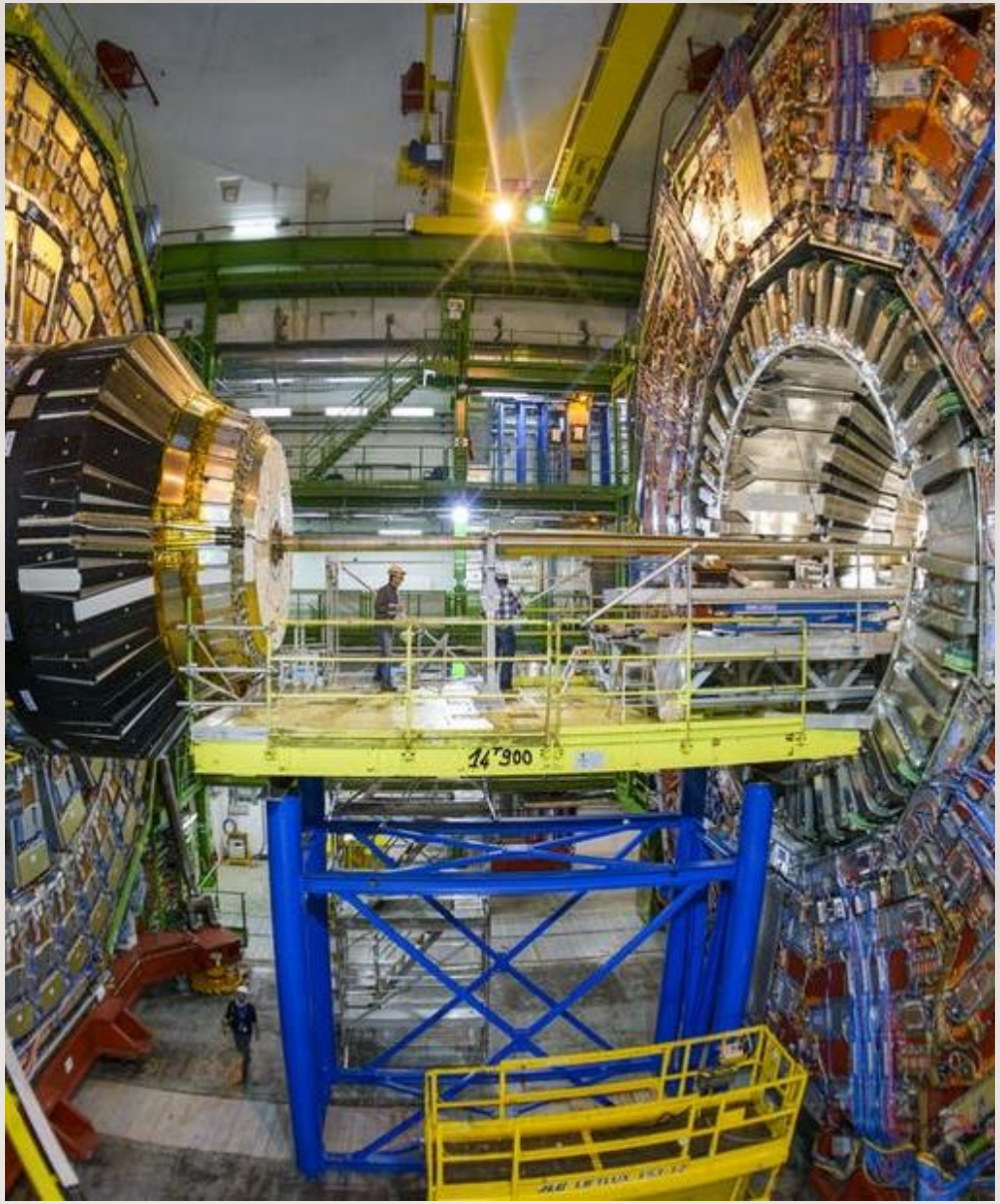
Standard Model

- Main interest are Z and W bosons (Gauge Bosons) force carriers of the weak force



Large Hadron Collider (LHC)

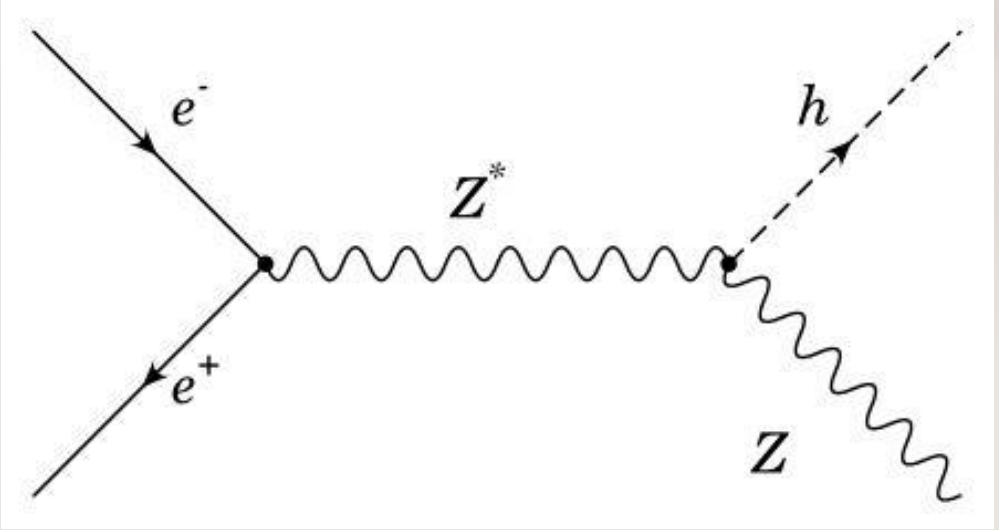
- Utilizes Proton-to-Proton collisions
- Protons are sped up to greater than 99.999 the speed of light
- Found Higgs Boson in 2012 (particle that gives mass)
- Very messy collisions due to the internal structure of protons(up and down quark, and gluons)



Future Colliders (CLIC)

- Compact Linear Collider (CLIC)
- Pros
  - $e^- \, to \, e^+$ collisions
    - Fundamental particles
      - No internal structure
- Cons
  - Estimated to reach over 50km in length
  - Primarily used to probe properties of the Higgs Boson and new physics
  - the beam must be accelerated to full energy in a single passage through the main linac.
  - Synchrotron radiation

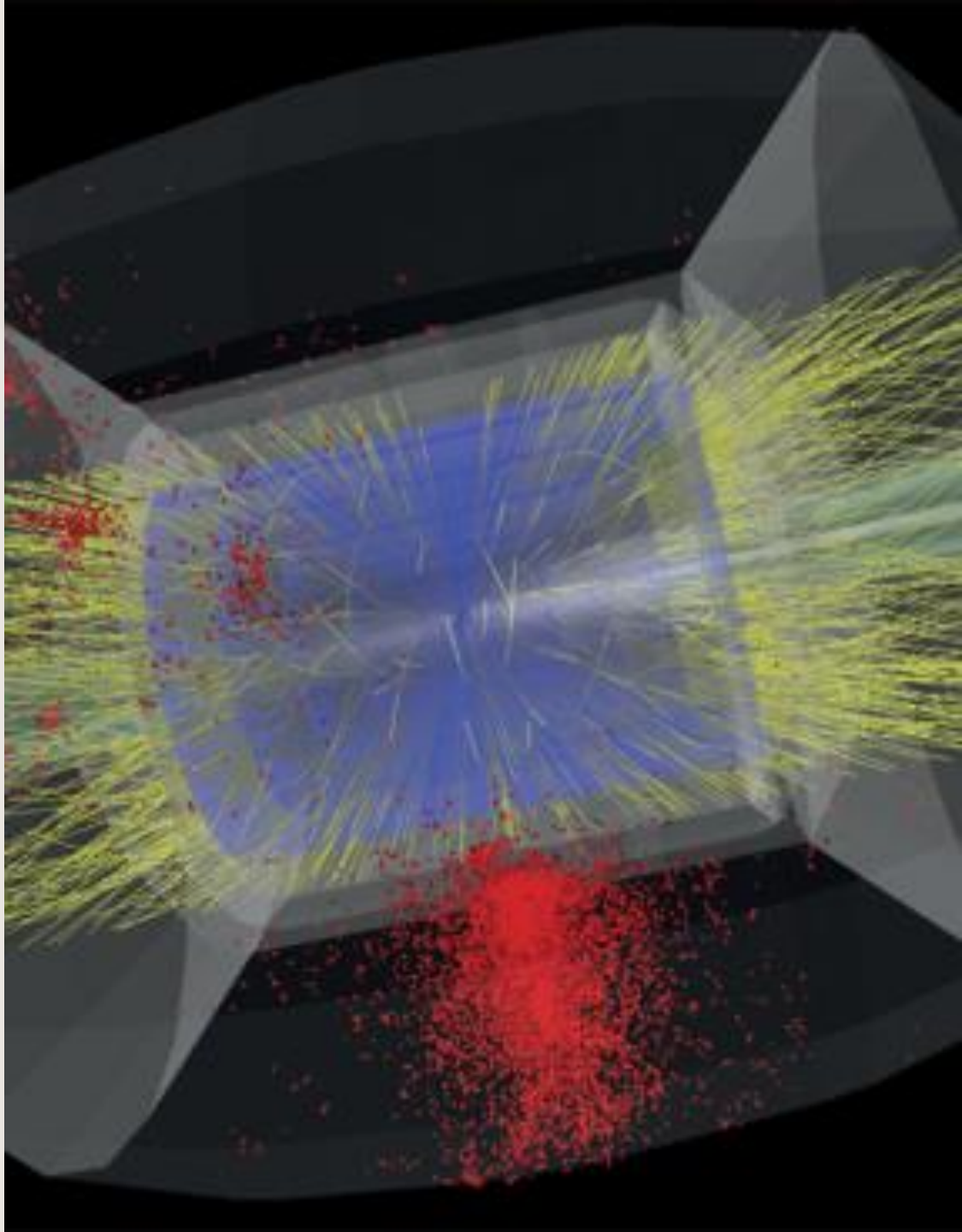
CLIC would be a "compact" linear collider that can collide electrons and positrons up to energies of 3 TeV.



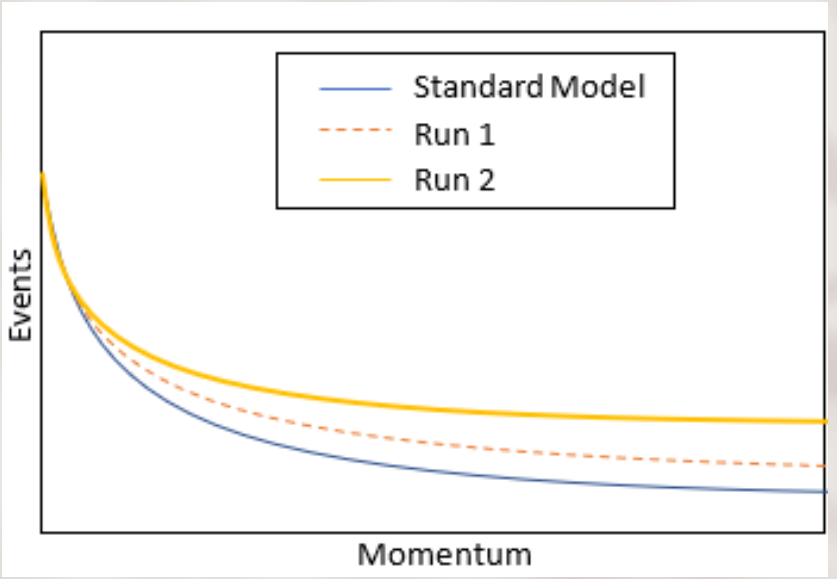
The dominant channel to produce Higgs bosons in electron-positron collisions is the associated production with a Z boson.

Future Colliders (Muon to Muon)

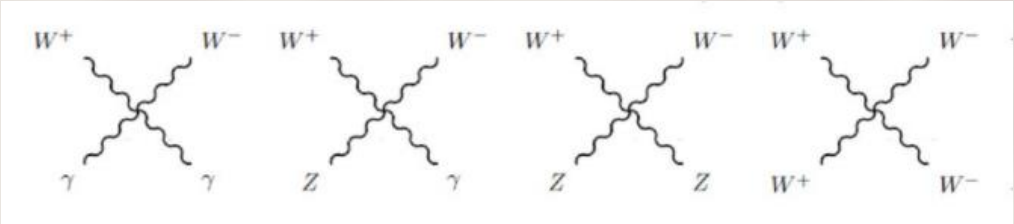
- Pros
  - Muons are point particles with large mass (105.66 MeV/c^2, 200x more massive than electrons)
  - Less radiation
  - More than one collision per run (more data)
- Cons
  - Muons have a short lifetime of 2.2μs. One therefore must be rather quick in producing, accelerating and colliding the muons; this rapid handling provides the main challenges of such a project. (time dilation)
  - Development of technologies to achieve desired collisions



My Contribution: Anomalous Quartic-Gauge Coupling



- Running simulations with new physics
- Compare simulations to the standard model and figuring out if we are sensitive to the new physics
- Compare results to other purposed colliders



Questions?