Homework

- 100 GeV electron enters (a) a Copper or (b) an Iron absorber. Where will be the shower maximum? How many particles will form the shower at its maximum? What is the average energy of the particles there?
- Compare the electromagnetic calorimeters of the ATLAS and CMS experiments. What technologies are used? How the energy and spatial resolutions compare? What do you think the arguments were when justifying the experiment's own designs?
- EM calorimeter has a stochastic term to its energy resolution of 0.05/sqrt(E). How can we ensure that the energy resolution for a E = 40 GeV photon does not exceed 1%?
- How will interact a muon with the detector material when it traverses through the CMS detector? How can we use the signals to identify the muon? Do the calorimeters play any role?
- A multi-purpose detector system using the traditional layered structure has a relative track momentum resolution of 0.00015 pT [GeV] $\oplus$ 0.005, an EM calorimeter energy resolution of 0.2/E[GeV] $\oplus$ 0.03/sqrt(E[GeV]) $\oplus$ 0.005 and a hadron calorimeter energy resolutions of 0.7/sqrt(E[GeV]) $\oplus$ 0.08. At what electron and pion energy will the tracking and the calorimeter measurements have the same precision for highly relativistic particles at pseudorapidity of 0? Which measurement is more precise at low / high momentum?