

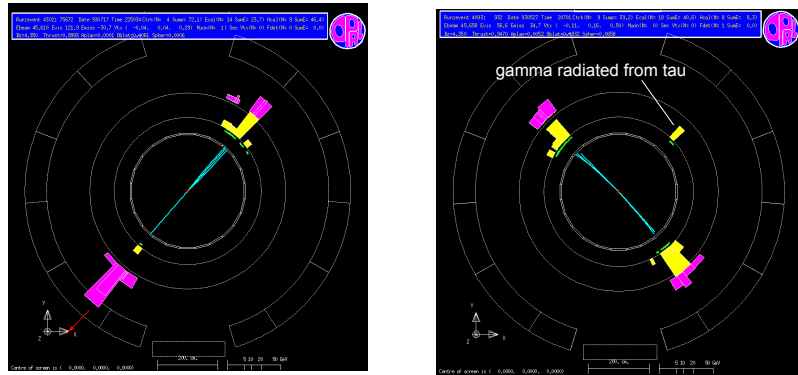
4442 Particle Physics
Mark Lancaster
Week 8

<http://www.hep.ucl.ac.uk/~markl/teaching/4442>

WEEK 8 : WEAK INTERACTIONS

- general characteristics of the weak interaction
- Feynman rules and couplings of weak interaction compared to QED.
- Chirality Operator and Helicity - Chirality connection (again !)
- Muon and tau decay
- _____ - Feynman diagrams for tau decays as examples of weak decays
- Muon lifetime formula - general weak decay width formula
- Spin directions / polarisation in pion then muon decay
- Ratio of electron and muon decay modes of the pion
- Quark vertices in weak interactions : weak flavour vs mass eigenstates
- CKM formalism
- GIM mechanism
- Decay of B & D mesons and their experimental identification

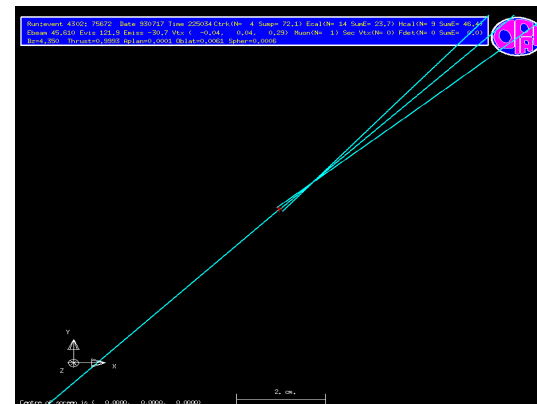
$Z \rightarrow \tau^+ \tau^-$; $\tau^+ \rightarrow \pi^+ \bar{\nu}_\tau$; $\tau^- \rightarrow \pi^+ \pi^- \pi^- \nu_\tau$



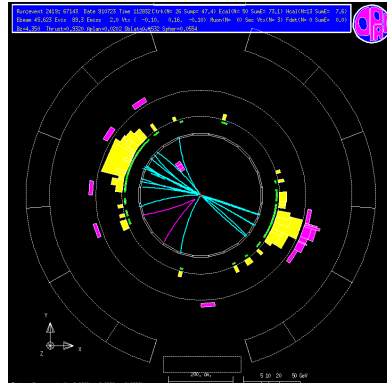
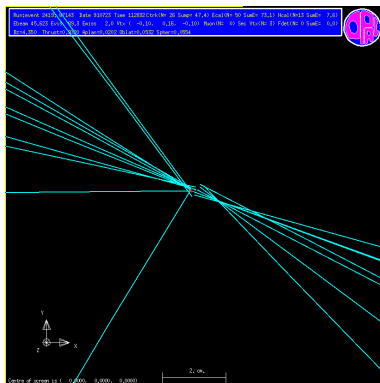
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Tau decay products very collimated due to large boost given to tau from Z decay.

Displaced vertex from tau decay



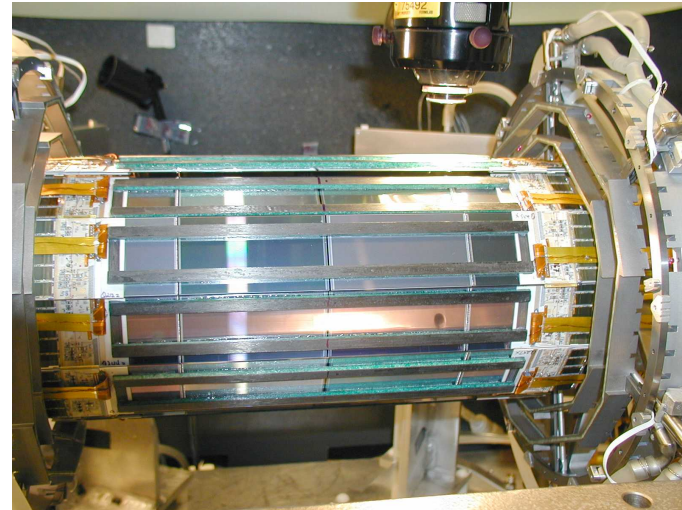
Displaced vertex from $Z \rightarrow bb$ and then B decays



Note K^0_s decaying to $\pi^+\pi^-$ (magenta) to give invariant mass of ~ 500 MeV

4442 : Particle Physics (2010)

Week 8 : p5



4442 : Particle Physics (2010)

Week 8 : p6

