

# **Whither the FCH? Forward Tracking and the TPC**

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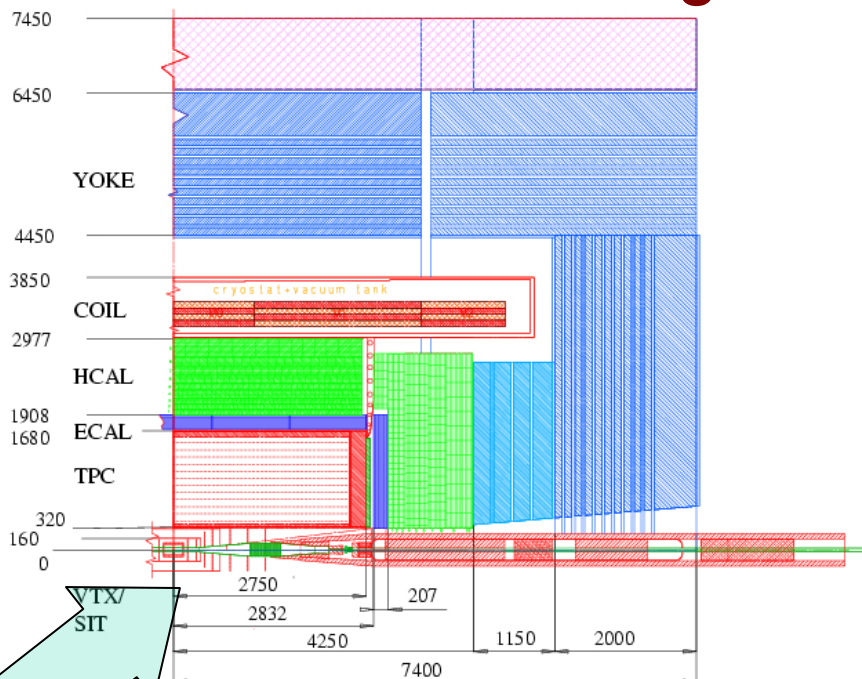


# What is the FCH?

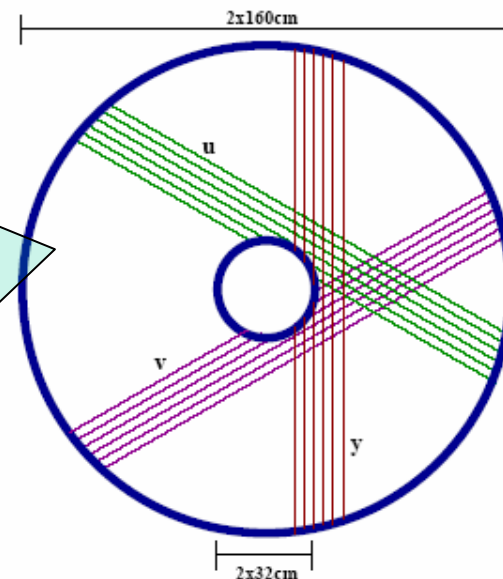
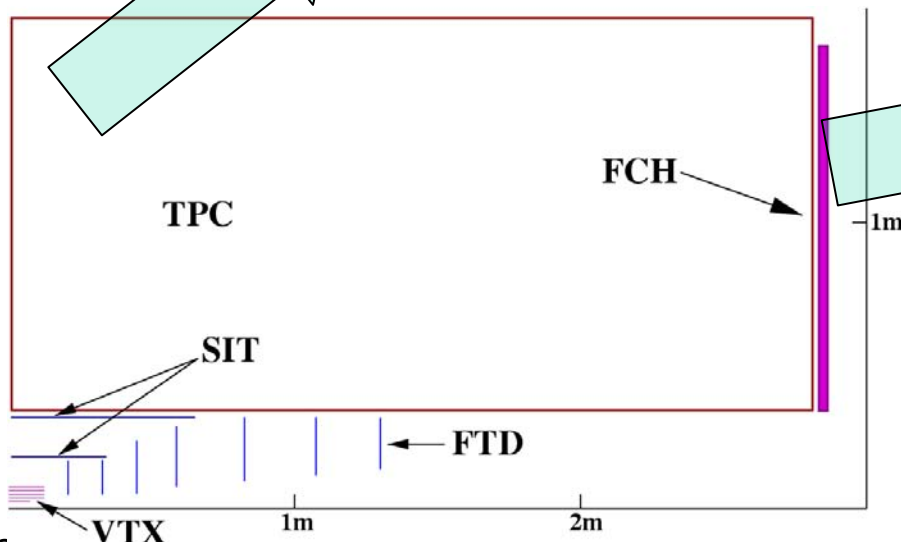
- That is a good question. Is it
  - A standalone tracker?
  - A track linker between the TPC and ECAL?
  - A preshower detector, with the TCP endplate as radiator?
  - A portion of the forward tracking?
- Does the FCH need to be
  - Fast?
  - Rad hard?
  - Materially thick (preshower) or thin (tracker)?
  - Extended to smaller angles than the TPC?



# Forward Tracking in the TESLA Design



- **FTD: Silicon Disks.**
  - 7 Layers (3 Pixel Layers, 4 Strips)
  - Coverage from  $25^\circ$  to  $7^\circ$  (436 to 122 mrad)
- **FCH:**
  - Straw Tubes: 6 2-layer chambers in TDR
  - Provides additional track hits in region of reduced TPC lever-arm and/or r/o pads
  - Must have a low overall profile
  - Other detector possibilities? Si Strips, Fibers, GEMs?

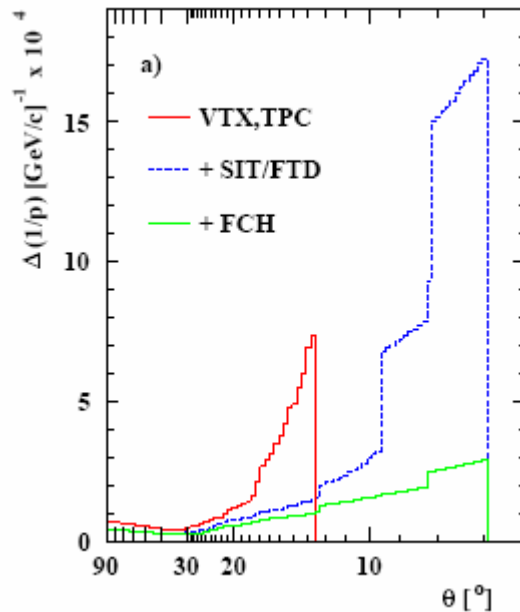


# Forward Tracking and the TPC

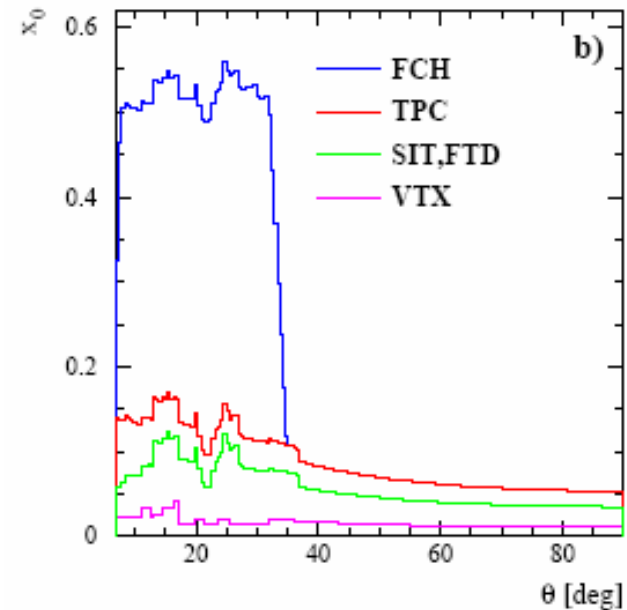
- **Tracking Question Set 4:**
  - How important is the FCH behind the TPC?
  - Do we need stand-alone tracking capability in there, or is a simple device which adds one or two hits sufficient?
  - Which technology is optimal for the FCH?
- **Some FCH Proposals (Not Exhaustive...)**
  - Something standalone → Strawtubes, Fibers?
  - Something that integrates with the rest of the Silicon detectors → SiFCH
  - Something that “replicates” the TPC endplate → GEM-FCH



# Can We Answer Question #1: How important is the FCH behind the TPC?



TESLA TDR results → large improvement in momentum resolution at forward angles using Si trackers + strawtube FCH



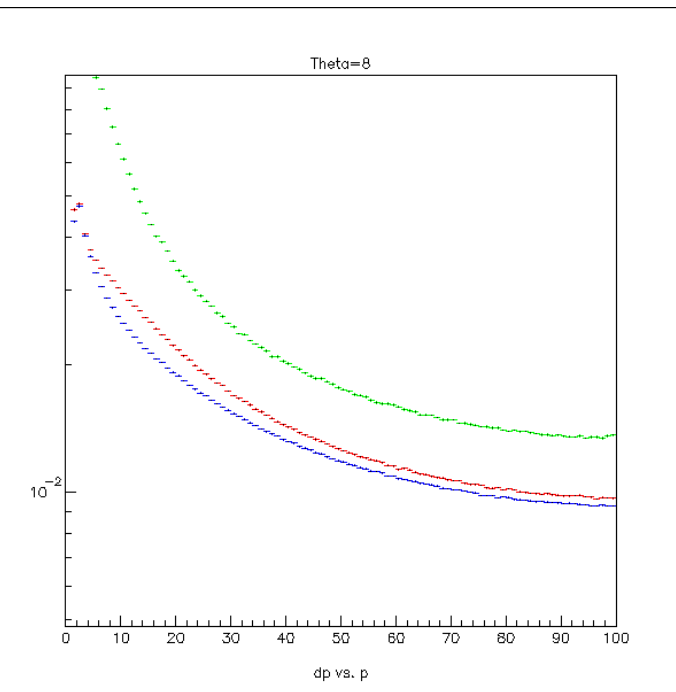
...but at the cost of half a radiation length of material at intermediate angles



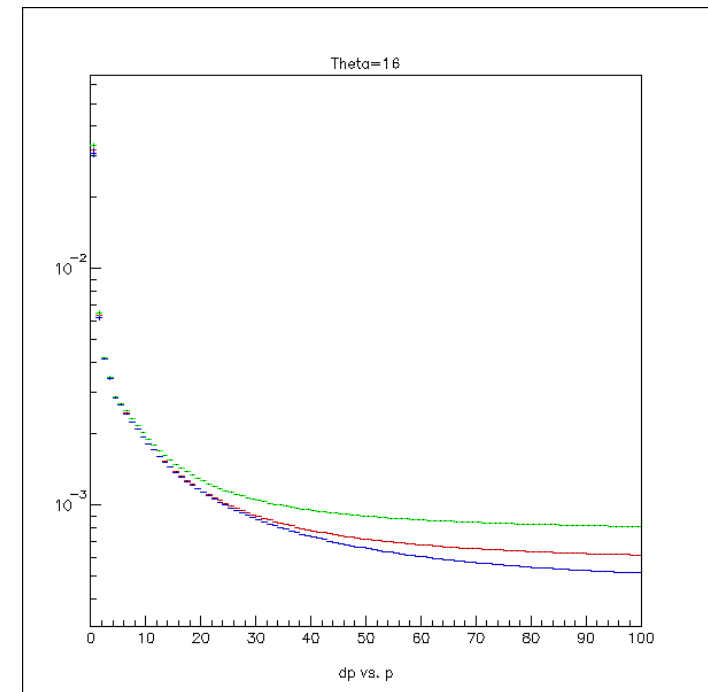
# Q#1: How Important is the FCH?

## Q#2: How Many Layers are Sufficient?

Tests of tracking with/without FCH using the SGV fast Monte Carlo  
(similar results have been obtained by the SiLC group)



— No FCH  
— FCH with 3 layers  
— FCH with 10 layers

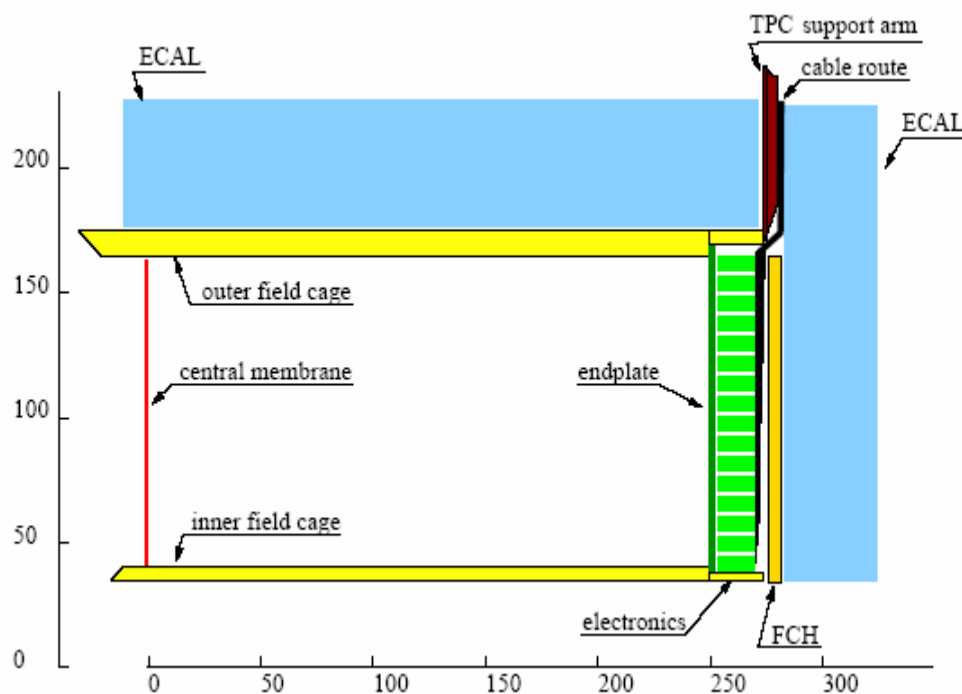


→ Something seems better than nothing!



# Question #3: Which Technology is Optimal?

- My gut feeling is that the FCH will be the step-child some larger detector
  - SiFCH : Similar to SIT and FTD, will likely use same readout electronics
  - GEM-FCH : Make use of TPC readout electronics, perhaps gas services
  - Strawtubes : Step-child of ATLAS strawtubes?
- Considerations
  - Terrible location => services for VTX, SIT, and TPC, readout cables
  - Impact on other systems => Mount to TPC or ECAL?
  - Cost Cost Cost



# How To Answer These Questions

- **We can continue fast simulation studies**
  - These can at least establish the need for some sort of FCH, and set rough estimates of optimal point resolution and angular coverage
- **We can move to more sophisticated studies using Mokka + Marlin**
  - Except there is no easy way to turn sub-detectors on/off in Mokka yet
  - And the forward tracking on MarlinReco still needs some work
- **We can identify the champions of the various proposed FCH technologies**
  - Agree on figures of merit
  - Work on realistic cost estimates



# ~~Conclusions~~ Commencements

- There seems to be good evidence that some sort of additional tracking is needed between the TPC and ECAL
- We need to define the parameters for optimizing this detector
  - momentum resolution, angular resolution, track/shower matching, photon identification...
- Technology decision should follow from physics optimization
  - The realist realizes that this has to be balanced with cost estimates
- So, who wants to work on this?

