Some edited slides from
"Projects and Testbeam needs for Central Tracking in 2010 – 2013 : Gaseous Tracking (TPC)"
by Yulan
and some of my own…

Yulan Li

ILC TB Workshop Orsay - 1st Preparatory Meeting

May 26, 2009

Preamble

- Information collection just started at LP
- Very preliminary feedback
- Mainly based on
  - ILD LOI
  - PRC2008
  - LCTPC MOA(2008)

Plans – from the MOA

Table 1: LCTPC R&D Scenarios for Large Prototype and Small Prototypes.

Large Prototype R&D		
Device	Lab(years)	Configuration
LP1	Desy/Eudet(2007-2009)	Fieldcage⊕2 endplates: GEM+pixel, Micromegas+pixel
Purpose: Test construction techniques using ∼10000 Alice/Eudet channels to demonstrate measurement of 6 GeV/c beam momentum over 70cm tracklength, including development of correction procedures.		
LP1.5	F.L.-Cern/Eudet(2010)	Fieldcage⊕2 endplates: GEM+pixel, Micromegas+pixel
Purpose: Continue tests using 10000 Alice/Eudet channels to demonstrate measurement of 100GeV beam momentum over 70cm tracklength, in a jet environment and with ILC beam structure using LP1.		
LP2	F.L.-Cern/Eudet(2011)	Fieldcage⊕endplate: GEM, Micromegas, or pixel
Purpose: Prototype for LCTPC including gating and other options, demonstrate measurement of 100GeV beam momentum over 70cm tracklength, and in jet evironment and ILC beam structure, test prototype LCTPC electronics.		

Plans (cont')

- In 2009 – 2010, many tests described at this LCTPC meeting (different modules with cosmics, beam, UV lamp, etc)
- 2010 – 2013, detailed design of the LCTPC mechanics, electronics and endcaps will take place, final prototypes to be evaluated with cosmics and test beams.

From the LOI:

The following list gives an overview of the currently envisioned timeline for completing the studies and the construction of the ILD TPC.

- 2009-12: Continue R&D on technologies at LP, SP, pursue simulations, verify performance goals (details are available in [79]). (see next slide)
- 2009-11: Plan and do R&D on advanced endcap: power-pulsing, electronics and mechanics are critical issues.
- 2011-12: Test advanced-endcap prototype at high energy and power-pulsing in high B-field.
- 2012-18: Design and build the LCTPC.

At the beginning of the period 2012-18, the selection must be made from the different technological options – GEM, MicroMegas, resistive anode, pixel, electronics, endcap structure – to establish a working model for the design of the LCTPC. This design will be used for the ILD proposal in 2012 and include pad segmentation, electronics, mechanics, cooling and integration, so that performance, timeline and cost can be estimated reliably. [2] For the technology selection, a scenario could be that questions must be answered as to which options give the best performance based on R&D results from LP, SP, electronics and endcap studies. Main performance criteria could be endcap thickness and σ_{point}, double-hit and momentum resolution for single tracks and for tracks in a jet environment. Choice of criteria to use will be decided over the next two years.

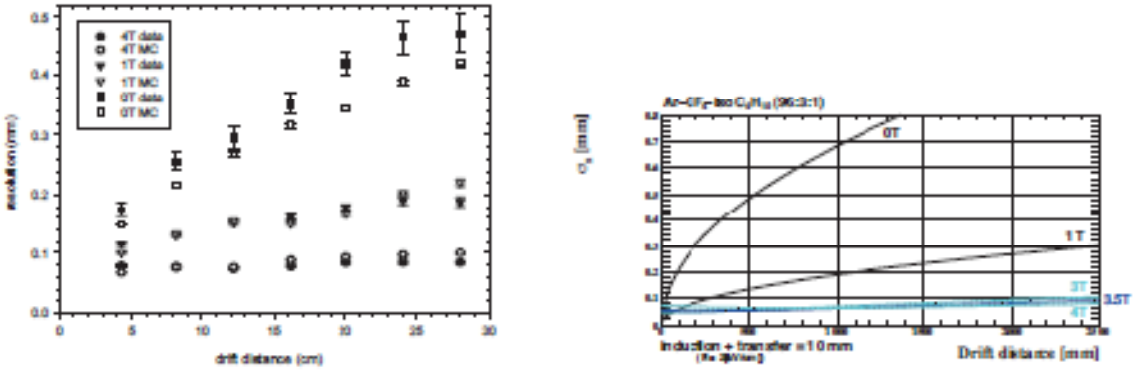

FIGURE 4.3-5. (left): Example of resolution results from a small prototype [92] measurements with TDR gas, $ArCH_4CO_2$ (95-3-2); other candidate gases are e.g. P5 and $ArCF_4$Isobutane. (Right): Theoretical resolution for $ArCF_4$Isobutane (96-3-1) gas (right), based on an algorithm [79] verified during SF studies.

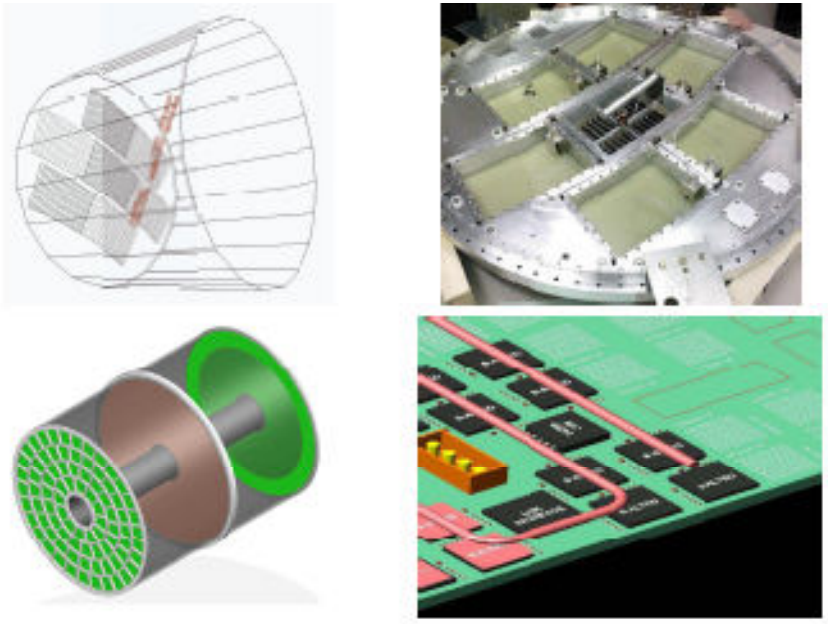

FIGURE 4.3-6. (Top left): Event display from the LP beam tests. (Top right) View of the Endcap subdivision as used for the Large Prototype. (Bottom left)Conceptual design of endplate for LCTPC. (Bottom right) Possible layout of PCB, electronics and cooling for the LCTPC.

RD Next steps:

2009 /06 /02

Updated 2009/08/20

Work plan after validation till 2012

We plan that each validated detector group will produce detailed baseline design by 2012. To this end the following items need to be accomplished.

1. Demonstrate proof of principle on critical components
   When there are options, at least one option should be advanced to a level of maturity which verifies feasibility.

2. Define a feasible baseline design. While a baseline will be specified, options may also be considered.

3. Complete basic mechanical integration of the baseline design accounting for insensitive zones such as the beam holes, support structure, cable, gaps or inner detector material.

4. Develop a realistic simulation model of the baseline design, including identified faults and limitations.

5. Develop a push-pull mechanism, workout the moving procedure, time scale, alignment and calibration scheme in cooperation with the relevant groups.

6. Develop a realistic concept of integration with the accelerator including the IR design.

7. Simulate and analyse updated benchmark reactions with the realistic detecgtor model. Include the impact of detector dead zones and updated background conditions.

8. Simulate and study some reactions at 1 TeV, including realistic higher-energy backgrounds, demonstrating detector performance.

9. Develop an improved cost estimate.

Bottom line:

We LCTPC have to make certain decisions and write them up by the end of 2012…