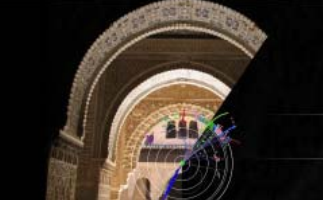


Gaseous Tracking: Summary in 9'

(little time, so I will only make a few qualitative statements)

Outline

- **List of talks:** for all tracking/vertexing talks, see R&D7 sessions on Tuesday and Thursday
- **What we have.**
- **What is missing.**

First, List of gaseous-tracking talks

Harry van der Graaf

A New Tracking Detector with ps Time Resolution

http://ilcagenda.linearcollider.org/contributionDisplay.py?sessionId=11&contribId=401&confId=5134

Status and Plans of the GridPix/Gossip Gaseous Tracking Detectors

http://ilcagenda.linearcollider.org/contributionDisplay.py?sessionId=11&contribId=403&confId=5134

- Madhu Dixit

Beam Tests of Linear Collider TPC Micromegas Module with fully integrated Electronics

http://ilcagenda.linearcollider.org/contributionDisplay.py?sessionId=11&contribId=406&confId=5134

- Ralf Diener

Beam Tests with the DESY GridGEM TPC Prototype Module

http://ilcagenda.linearcollider.org/contributionDisplay.py?sessionId=11&contribId=407&confId=5134

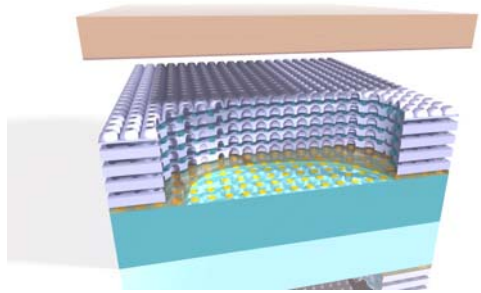
- Michael Hauschild

Tracking Performance in CLIC_ILD and CLIC_SiD

http://ilcagenda.linearcollider.org/contributionDisplay.py?sessionId=11&contribId=408&confId=5134

Talks: executive summary

Harry van der Graaf



A New Tracking Detector with ps Time Resolution

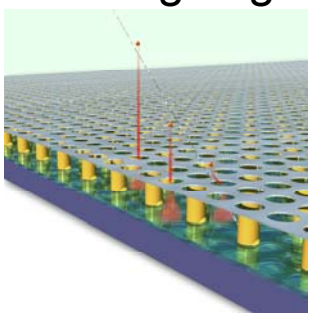
Harry presented several ideas (no data):

- electon-emission membrane
- μEM micro electron multiplier integrated on pixel chip ⇒ 2ps time resolution
- μEM + 'classical' photo cathode: Timed Photon Counter TiPC Tipsy
- μEM + Electron Emission Membrane: MIP tracking detector

Harry considers Tipsy to be very interesting since it potentially has ps timing (BX timing for ILC/CLIC experiments), can stand B-fields, make 3-D pictures by measurement of time of flight

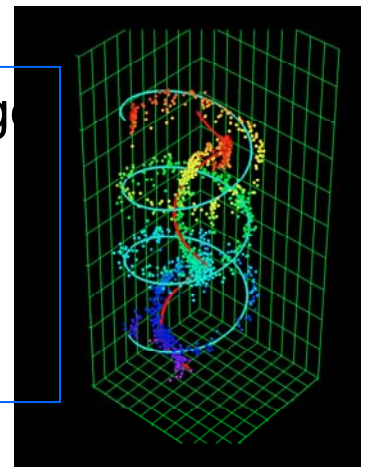
Status and Plans of the GridPix/Gossip Gaseous Tracking Detectors

GridPix tests going well…



GridPix: readout of TPC ionisation charg
single electron sensitive (gaseous) detector

Gossip: Gas On Slimmed SIlicon Pixels
Essential: thin gas layer (1 mm)

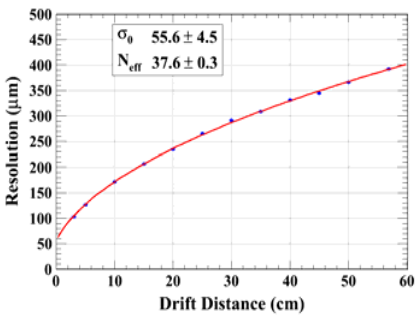


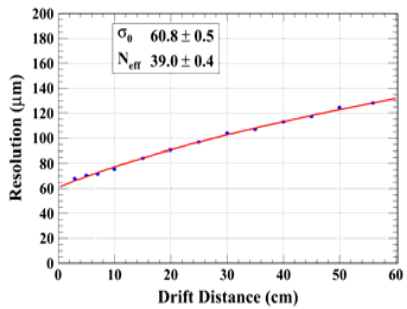
Talks: executive summary

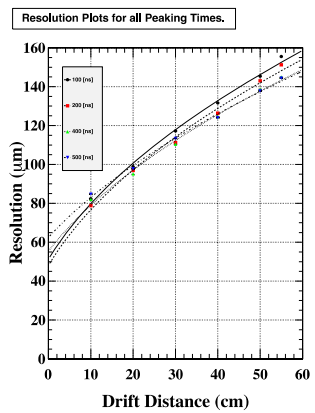
Madhu Dixit

Beam Tests of Linear Collider TPC Micromegas Module with fully integrated Electronics

- Micromegas module with resistive anode for LP TPC is now well defined
- A module with fully integrated electronics has been tested in a beam. Resolution ~ 50μm resolution for 3mm wide pads
- Seven module analysis software development in progress
- A serial production and characterization will be carried out in 2012. A test bench at CERN will be used to study the uniformity and thermal properties





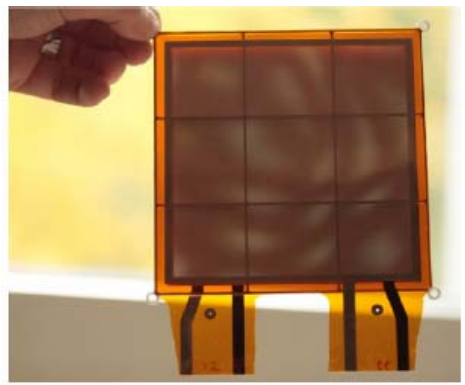


Talks: executive summary

Ralf Diener

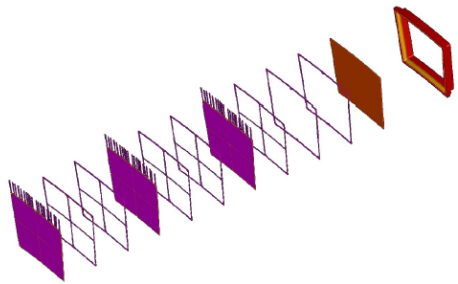
Beam Tests with the DESY GridGEM TPC Prototype Module

- Idea: replace frames to mount GEMs by a thin grid:
  - Grid made of Aluminum Oxide
  - Based on studies in small prototype (Ø ~ 30cm)
- Advantages:
  - Lightweight, integrated structure
  - Improved flatness of GEM foil:



Status

- A triple GridGEM module was constructed and tested in the Large Prototype at the DESY test beam stand
- Several problems of the module design were identified and based on this experience a new iteration will be developed
- First look at the data shows reasonable results
- Further analysis ongoing



Talks: executive summary

Michael Hauschild

Tracking Performance in CLIC_ILD and CLIC_SiD

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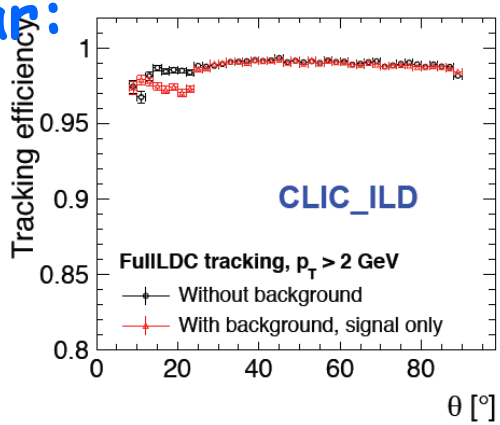
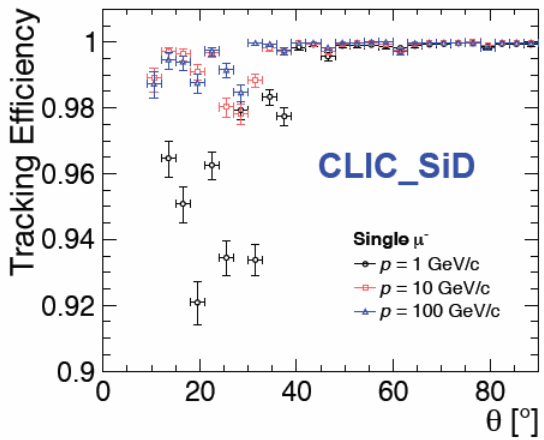
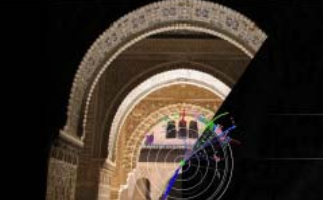


single muons:





Conclusions

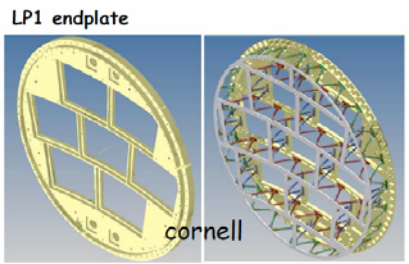
- **Requirements from physics performance**
  - momentum resolution: $\sigma_{pT}/p_T^2 \approx 2 \cdot 10^{-5}\,\mathrm{GeV}^{-1}$
  - time stamping accuracy: 5 – 10 BX (2.5 – 5 ns)
- **CLIC tracking systems adapted from ILD and SiD**
  - main tracker unchanged
- **Tracking efficiency**
  - 97 – 99% for tracks in tt events (CLIC_ILD) or di-jets (CLIC_SiD) from 2 – 20 GeV
- **Momentum resolution ≤ $2 \cdot 10^{-5}\,\mathrm{GeV}^{-1}$ fulfilled for both CLIC_ILD and CLIC_SiD**
  - time Stamping capabilities for CLIC_ILD demonstrated

Gaseous Tracking: Summary

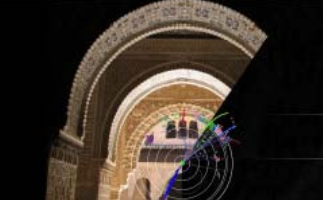
- What we have (LC-TPC):

⇒ Large Prototype (system) tests at Desy with Gem, MicroMegas, Pixels, Electronics designs making good progress:

1. endplate, fieldcage design "understood"
2. point resolution "understood"
3. gas "understood"



⇒ Several small prototypes being used for tests of gating, cooling, etc issues.



• What is missing (LC-TPC)…

From the LCTPC MOA, Addendum 2011

3.3.2 (II) 2009 - 2011

TPC design, performance and engineering issues were presented at LCTPC collaboration meetings on 21-22 September 2009

and 6-7 July 2011
http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=5231. These meetings included a reassessment of the R&D priorities, a continuing process. Table 4 reflects the present thinking, in approximate order of priority:

Table 4

- Continue tests in electron beam to perfect correction procedures
- Advanced endplate studies with a maximum of 25% X0 including cooling
- Powerpulsing/cooling tests using both LP and SP
- Design/test gating device
- Future tests in hadron beam for momentum resolution

and for performance in a jet environment

- Ion backflow simulations of ion sheets for Gem, Micromegas