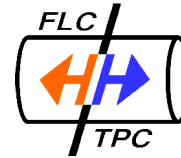


Ralf Diener  
Peter Schade  
Klaus Dehmelt



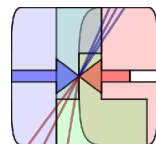
# The ILC TPC Large Prototype : status and plans



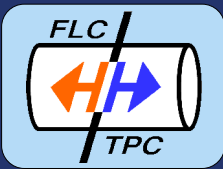
Universität  
Hamburg



- **Field Cage**
- **Field Strip Foil**
- **Surroundings**
- **Time Schedule**



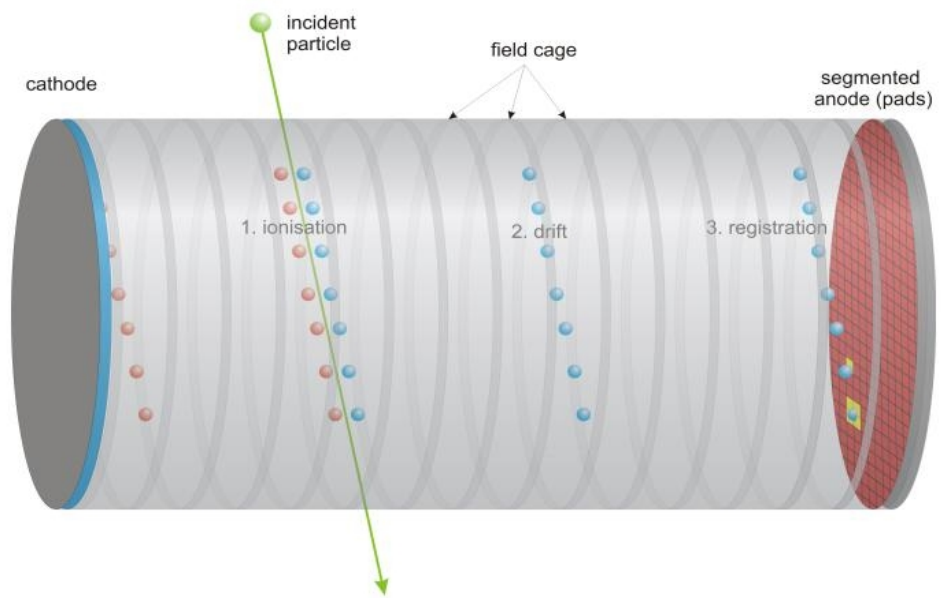
bmb+f - Förderschwerpunkt  
Elementarteilchenphysik  
Großgeräte der physikalischen  
Grundlagenforschung



**The ILC Large TPC Prototype**

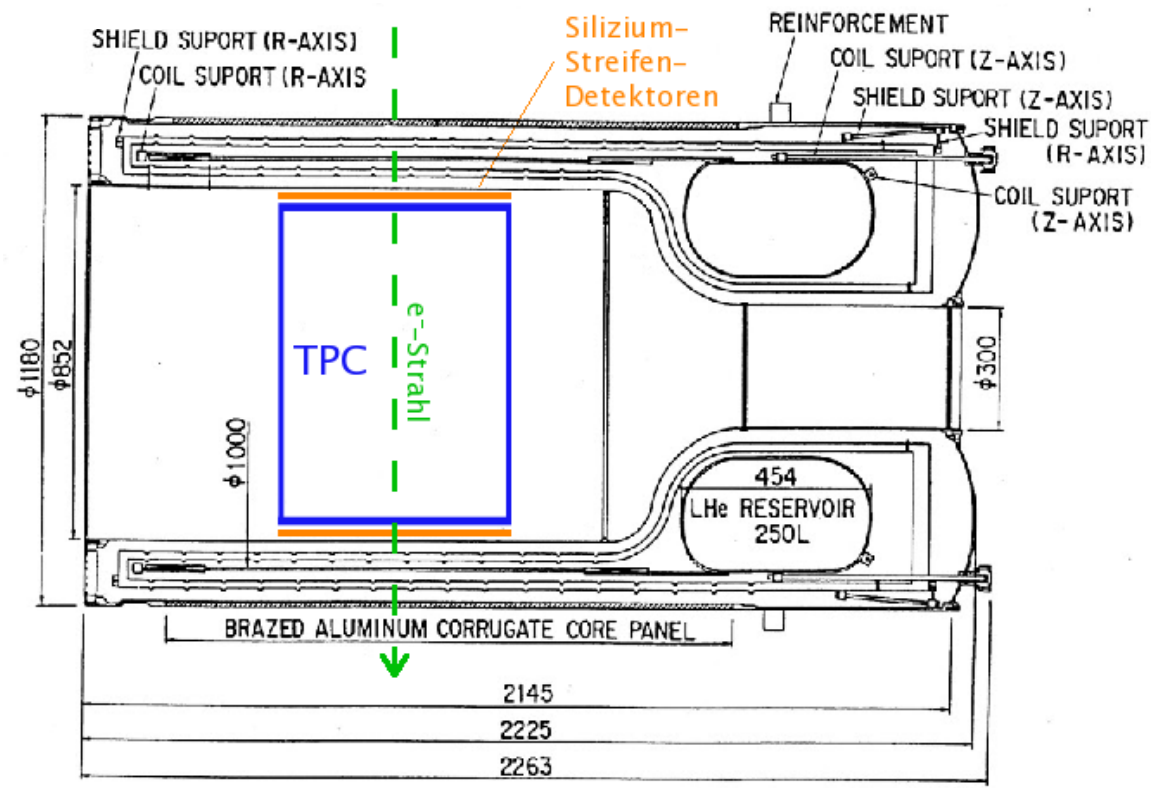
1. Setup
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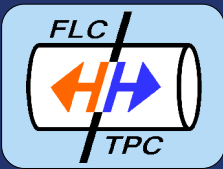
# The Large TPC Prototype Setup



- Reminder TPC:
  - Gas filled volume
  - High electric field inside
  - Particle ionizes gas molecules and electrons are drifted to anode
  - Should be lightweight (not much material before Calorimeter)

- Large TPC prototype:
  - Build inside EUDET project
  - Fit into 1T PCMAG (already installed at DESY HH testbeam area)
  - Additional Si-Strips as hodoscope

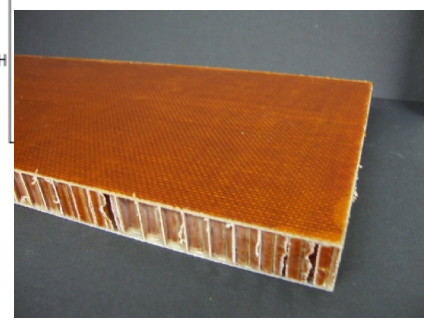
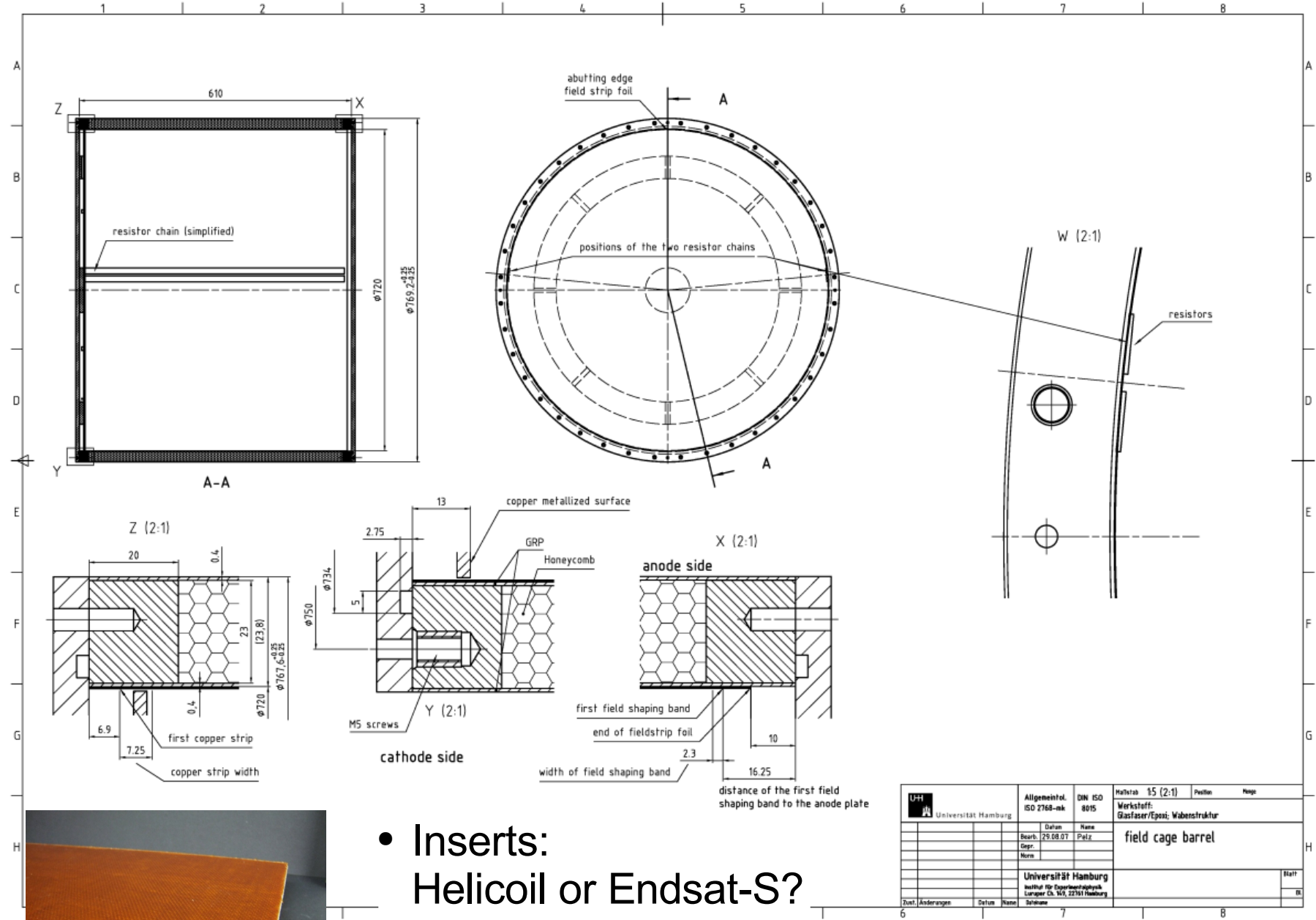




**The ILC  
Large TPC  
Prototype**

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# Latest Technical Drawings of LP Fieldcage

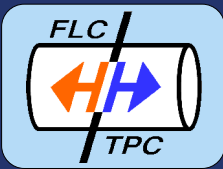


- Inserts: Helicoil or Endsat-S?
- Screws: 5 or 6mm?

Universität Hamburg	Allgemeintol. ISO 2768-mk	DIN ISO 8015	Maßstab 1:5 (2:1)	Position	Name
	Bearb. 29.08.07	Zeichner	Werkstoff: Glasfaser/Epoxy; Wabenstruktur		
	Name	field cage barrel			Blatt
	Univ. Änderungen	Datum	Name	Zeichner	Blatt

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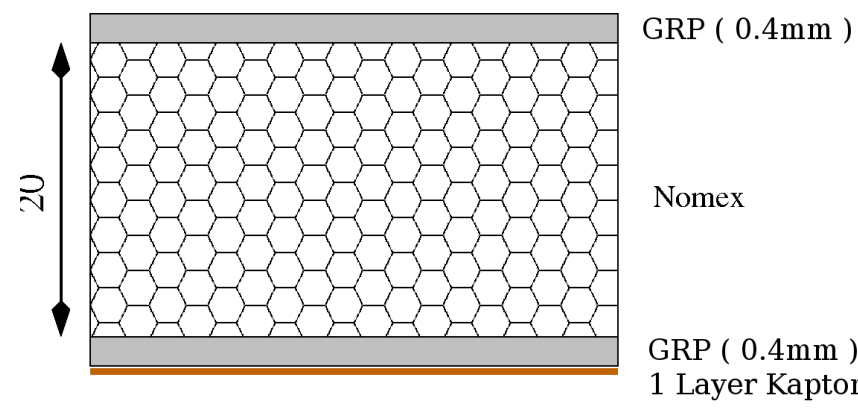
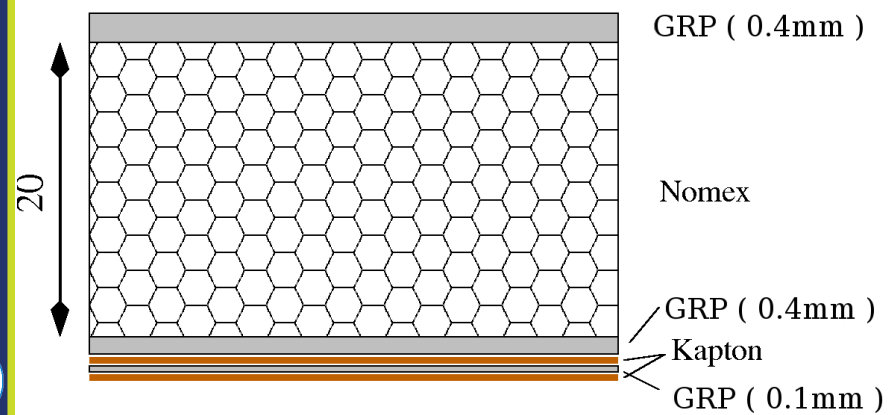
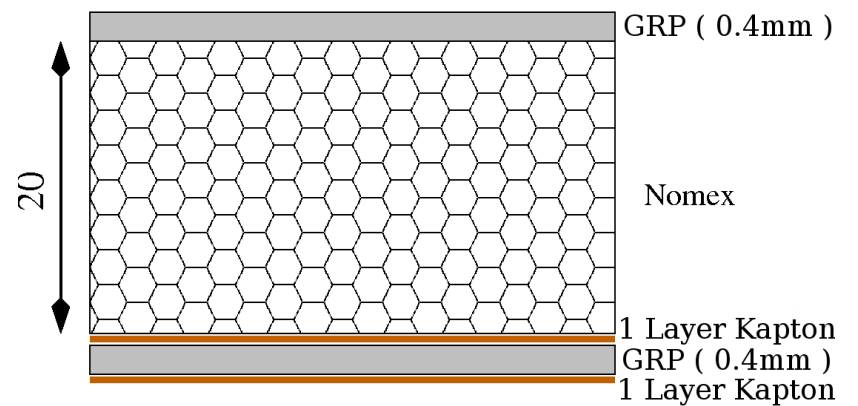
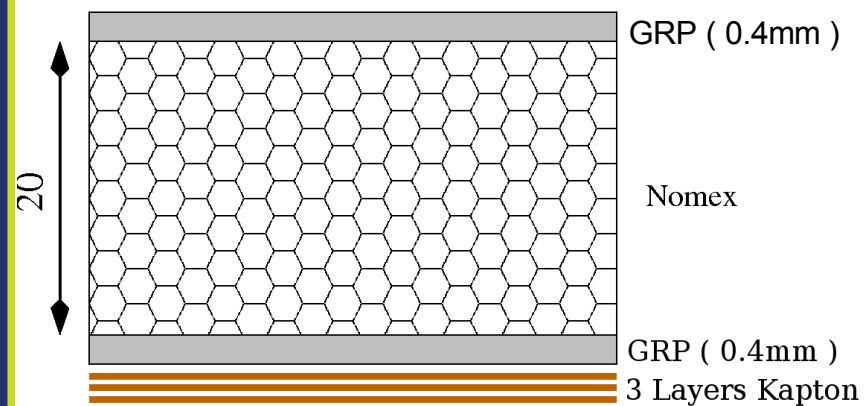




The ILC  
Large TPC  
Prototype

# Fieldcage Wall Test Samples

- Sample pieces with different cross sections available:
  - sufficient HV stability?
  - to test mechanical stability
  - to test manufacturing procedures
    - experience: gluing of Kapton on Kapton difficult → air bubbles

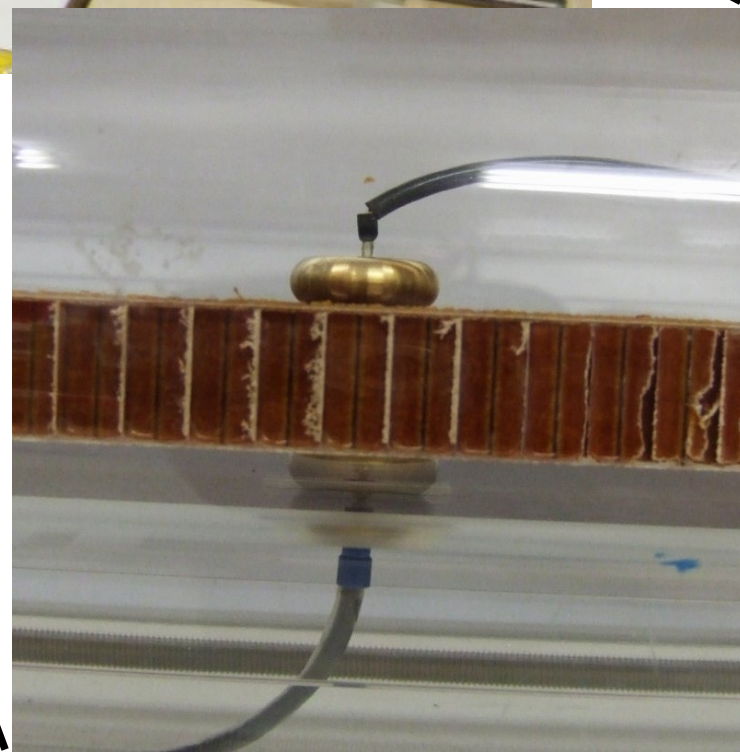
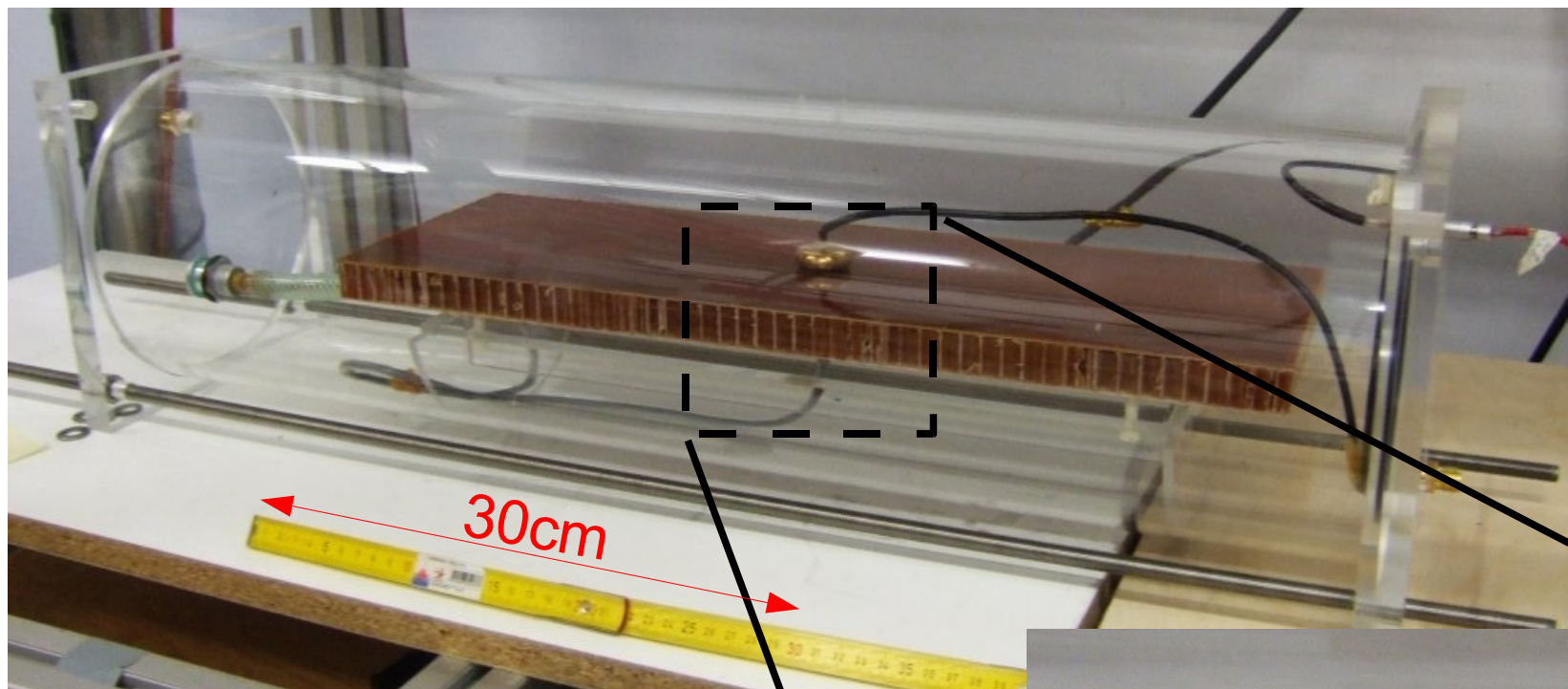


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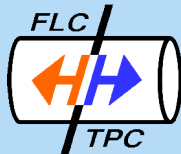
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Hamburg University



## HV Tests of Fieldcage Wall



- Each sample piece tested up to 24kV including overnight test
- Every piece passed the test without breakdown
- This/next week: test up to 30kV



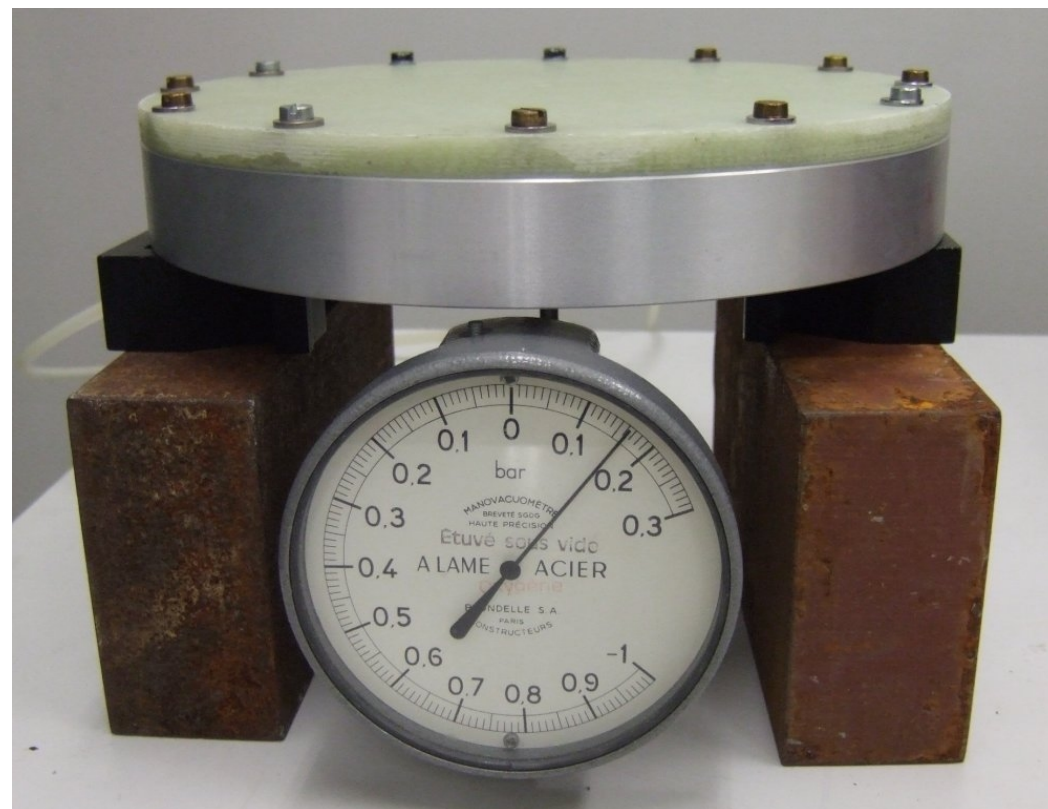
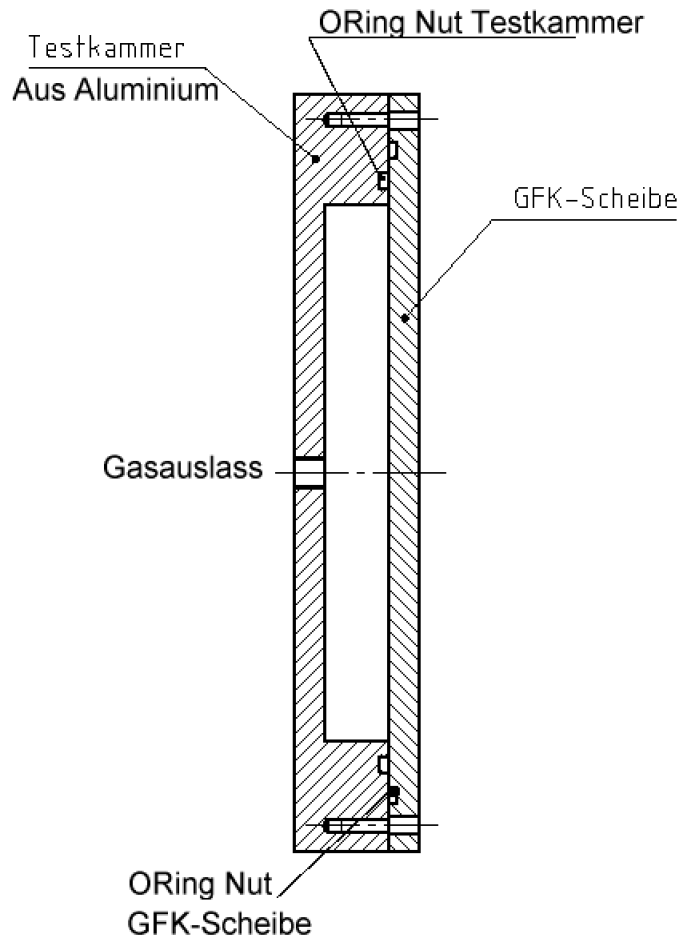
The ILC  
Large TPC  
Prototype

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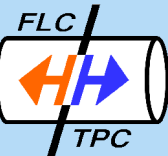
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Hamburg University



# Gas Tightness Tests



- O-Ring Groove can be in GRP endplate or Aluminum chamber
  - Overpressure of 160mbar still kept after one week with O-ring in GRP plate
  - Test with O-ring in Aluminum chamber outstanding (but should in principle work even better)



The ILC  
Large TPC  
Prototype

## 1. Setup

## 2. Fieldcage

- Drawing
- Wall Samples
- HV Stability
- Gas Tightness

## 3. Field Strip Foil

- Sample Foil
- Field Calculations
  - Perfect Model
  - Real Resistors
  - Tilted Plates
  - Displacement

## 4) Endplate

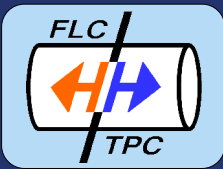
## 5) Surroundings: Hodoscope and Trigger

## 6) Magnetic Field Calculations

## 7) Schedule

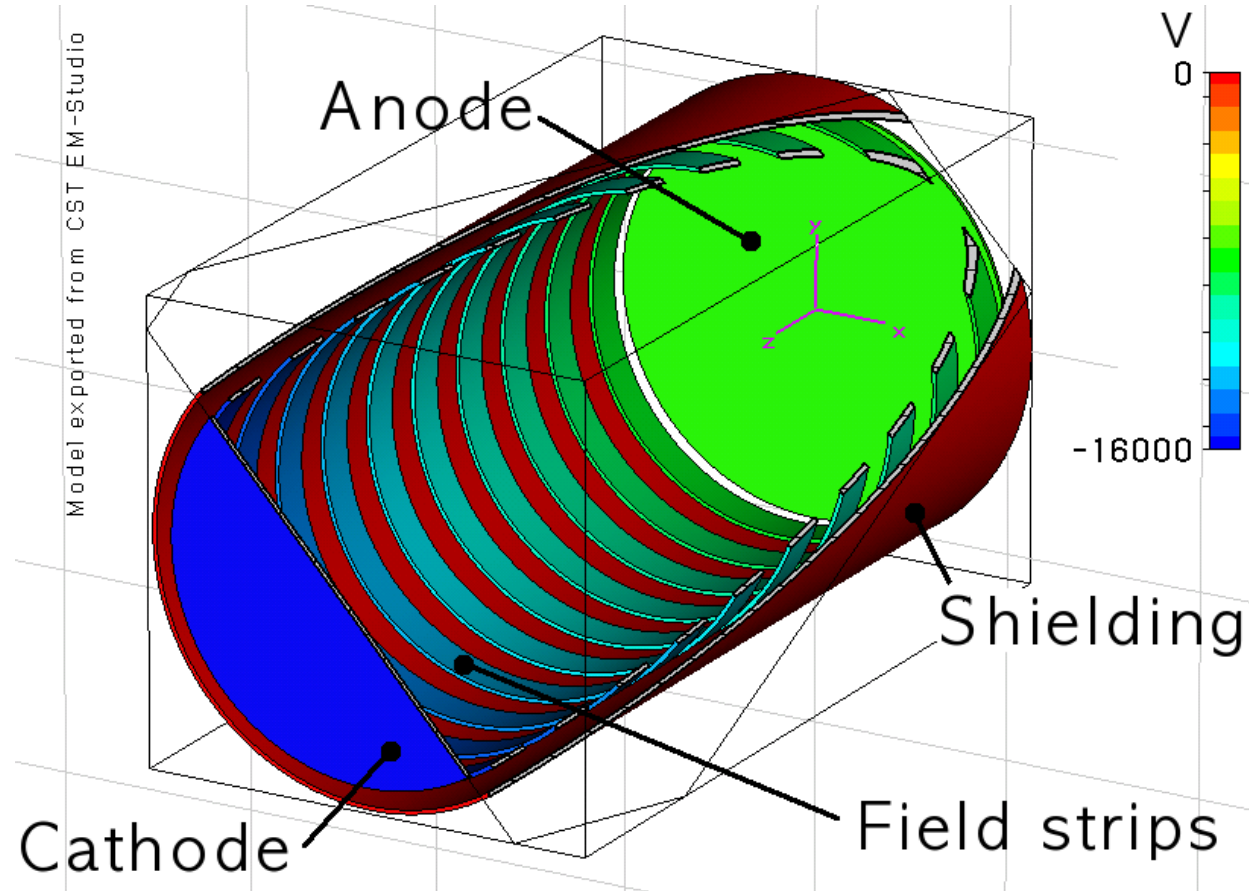
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Large TPC  
Prototype

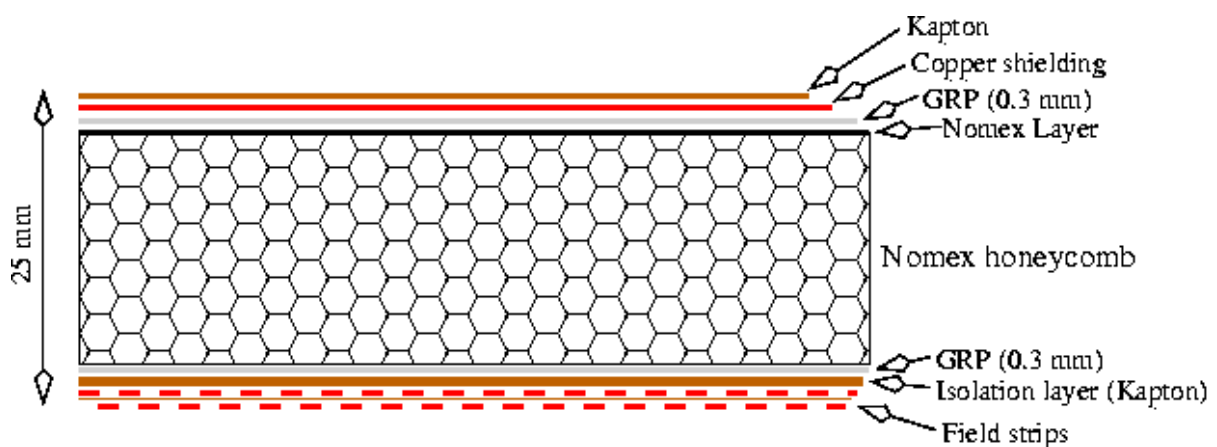
# Layout of the Fieldstrip Foil



- Field strips ensure a very homogeneous electric field inside the drift volume

## • Wall cross section:

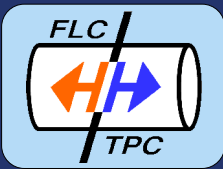
- shielding
- honeycomb
- field strips



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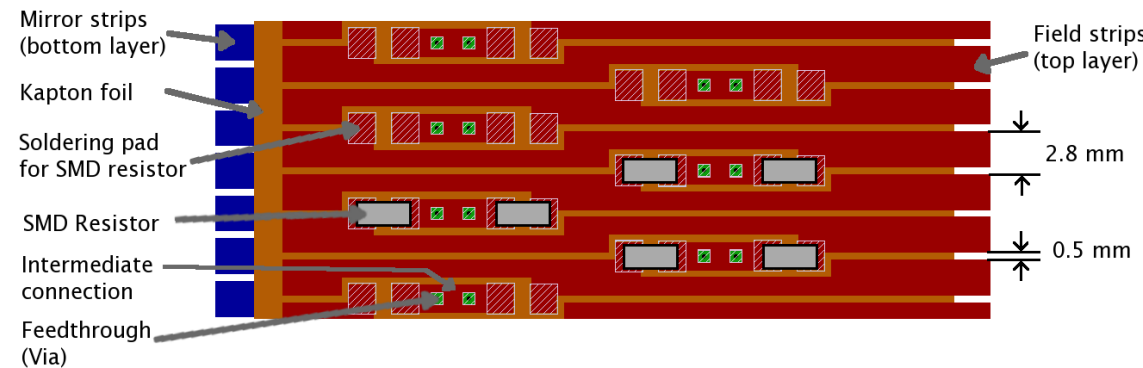
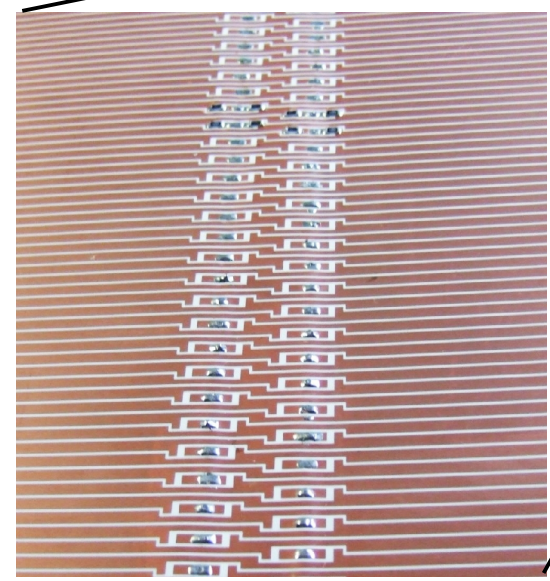
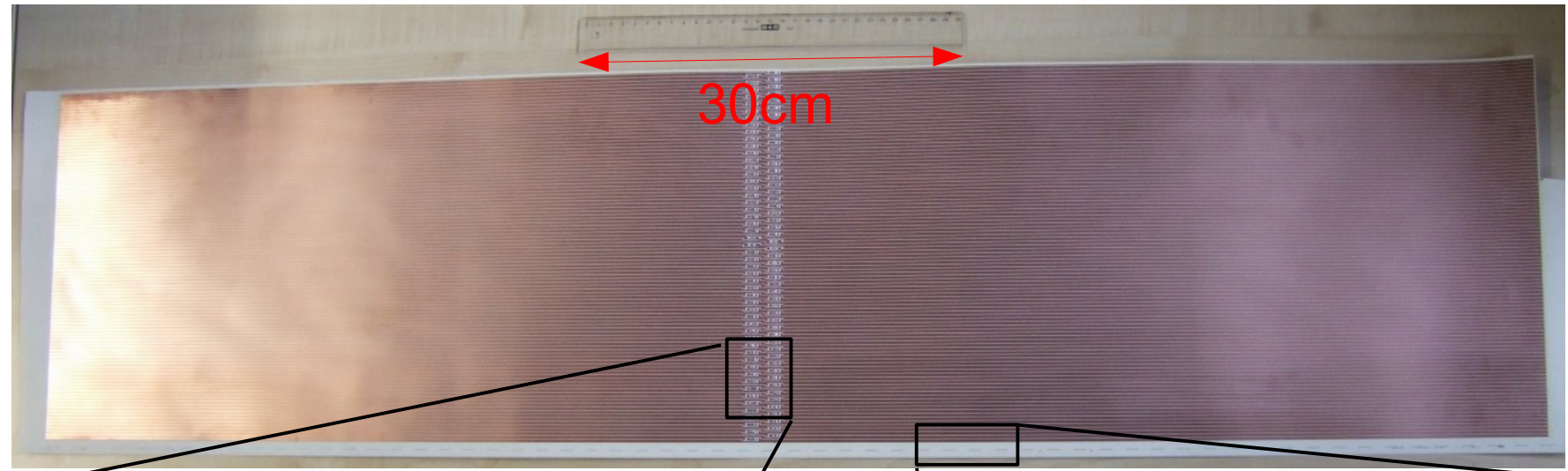
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**The ILC  
Large TPC  
Prototype**

# Sample Piece of the Fieldstrip Foil



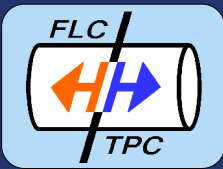
- ~100V between two strips possible in operation

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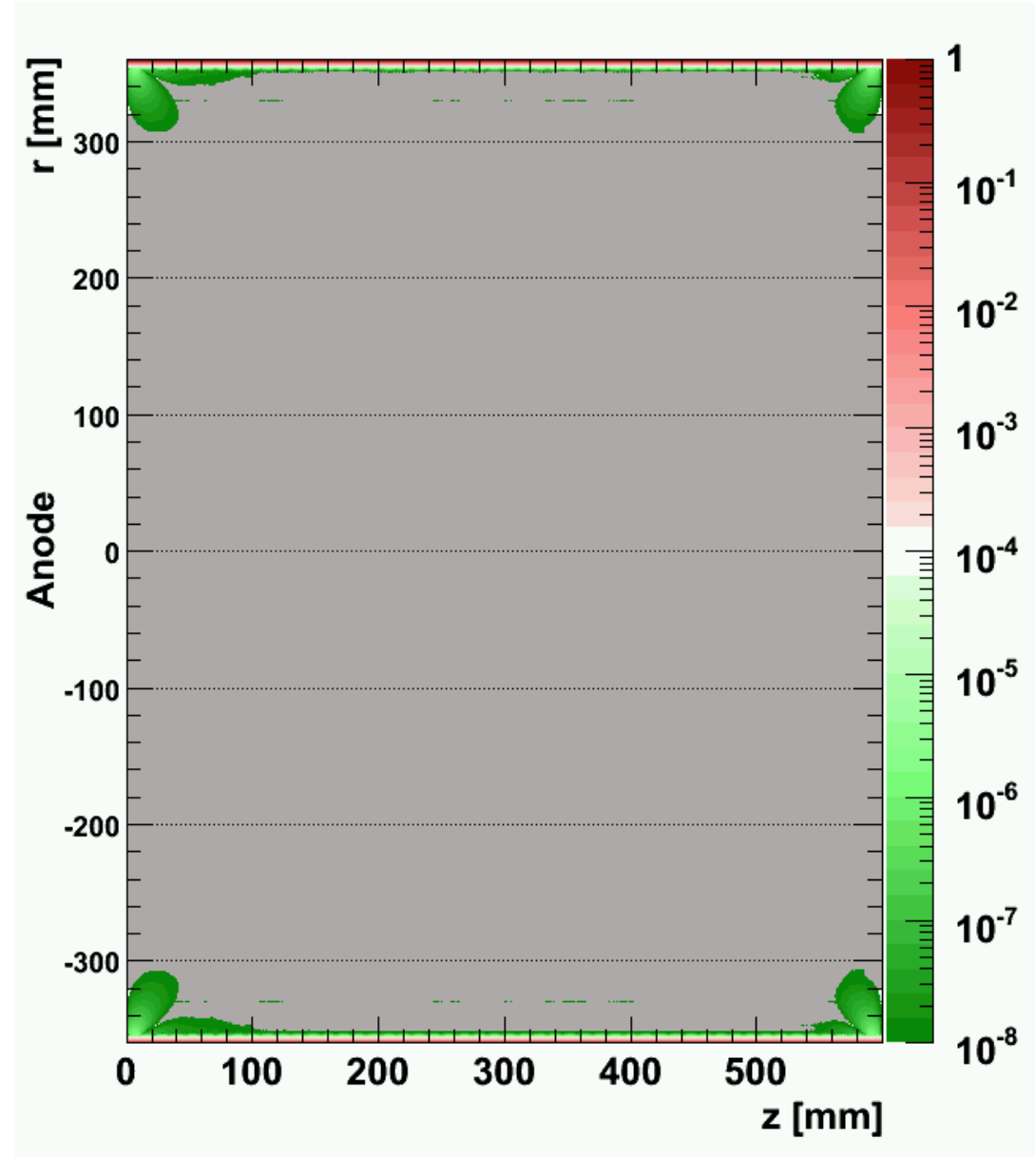


**The ILC  
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# Field Calculations

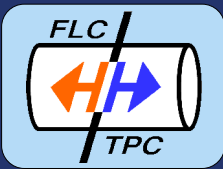
- Field with mirror strips and shown strip layout



Shown:  
 $\Delta E / E_{\text{nominal}}$

Goal:  
Deviations  
below  $10^{-4}$

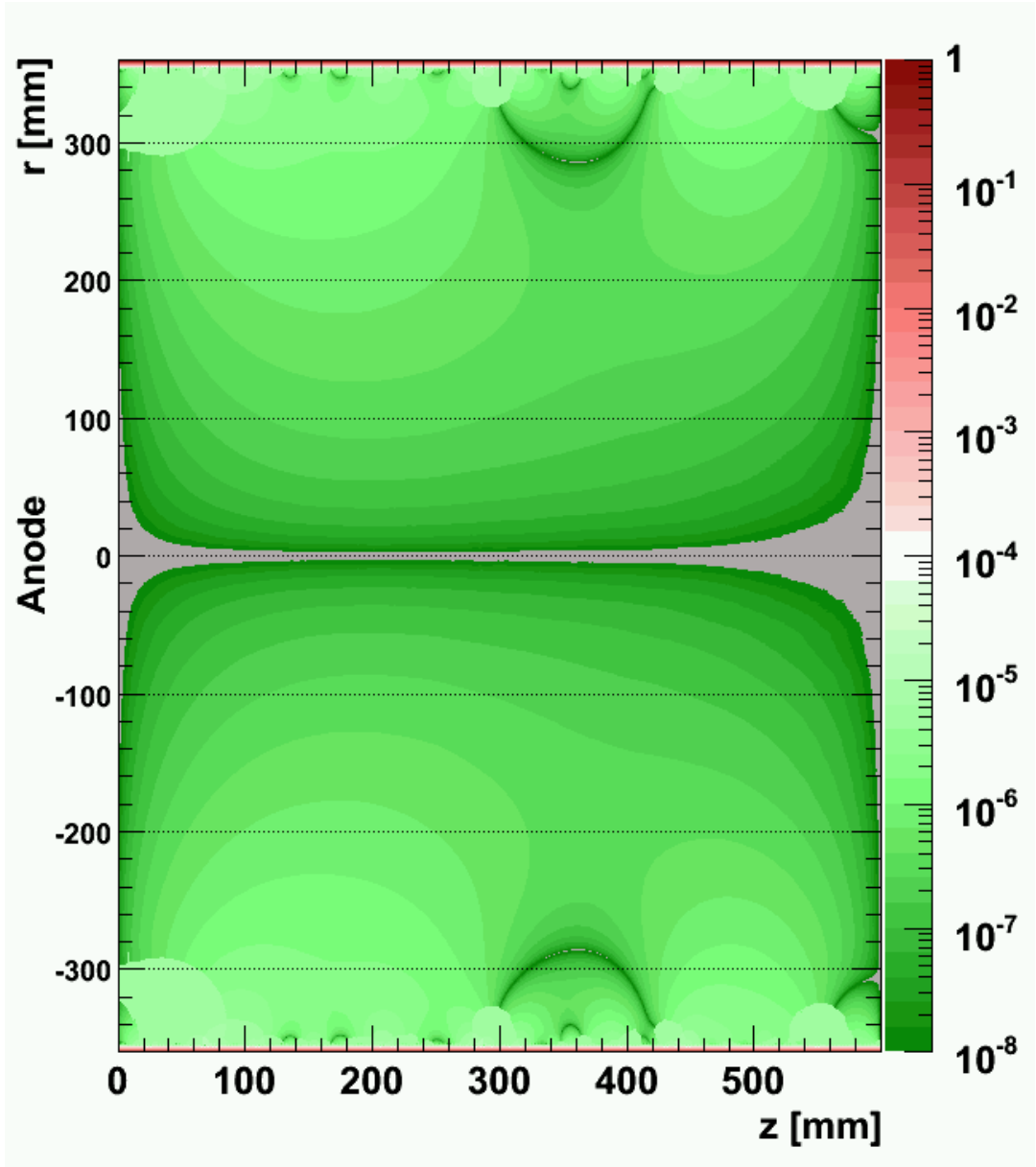
= Value below Accuracy Limit



The ILC Large TPC Prototype

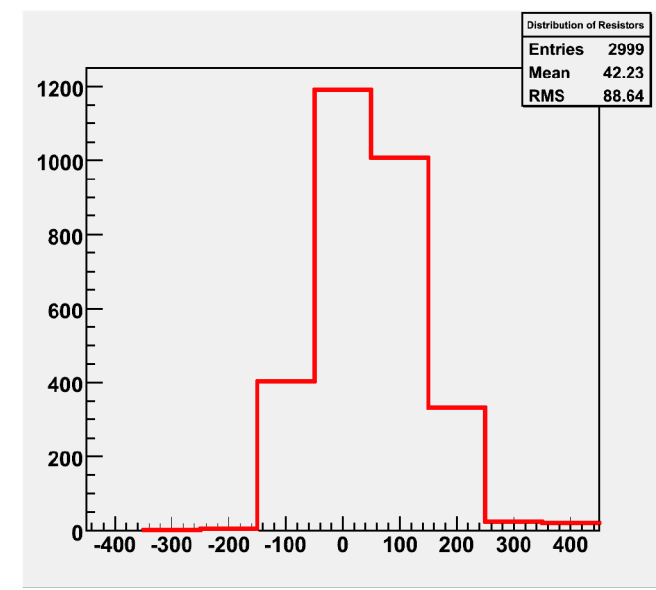
# Field Calculations

- With Non-Perfect Resistors:  $1\text{M}\Omega \pm 0.2\text{‰}(=200\Omega)$



Shown:  
 $\Delta E / E_{\text{nominal}}$

Goal:  
Deviations below  $10^{-4}$

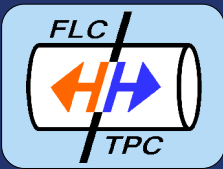


■ = Value below Accuracy Limit

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The ILC  
Large TPC  
Prototype

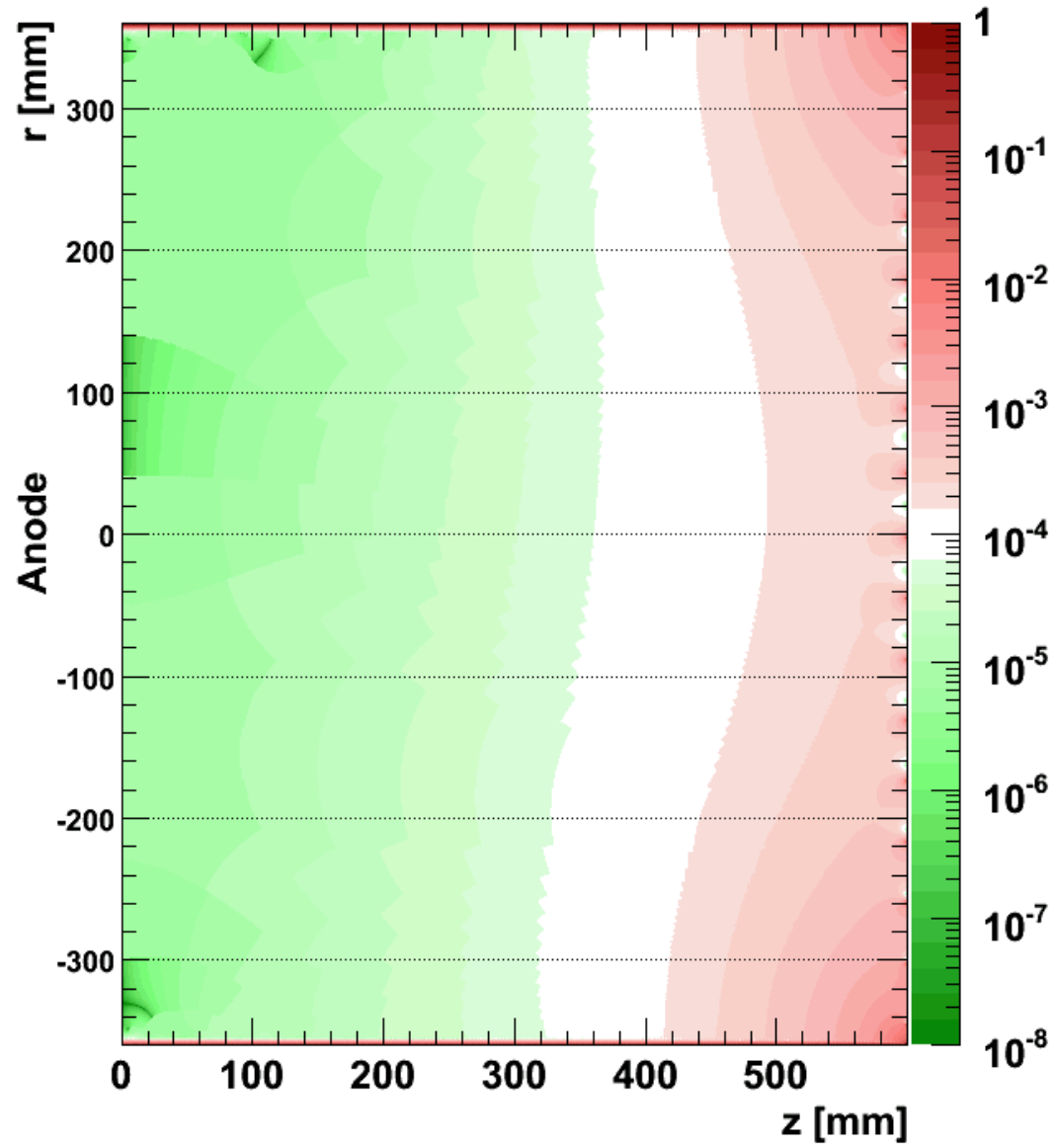
# Field Calculations

- With Non-Perfect Resistors and Tilted Cathode

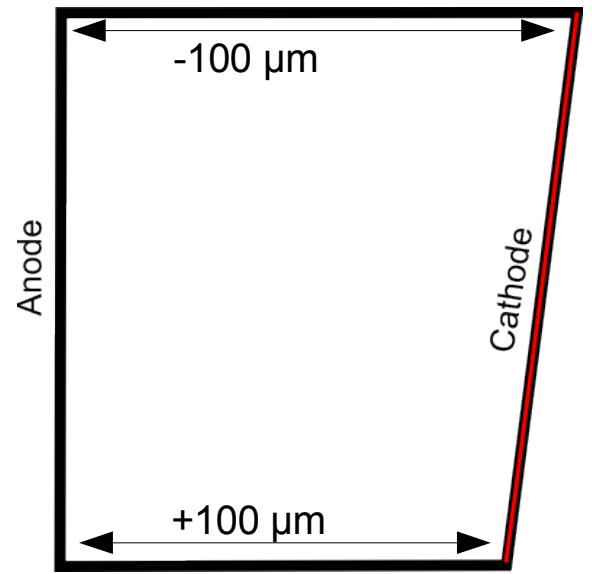
(manufacturing accuracy)

Shown:  
 $\Delta E / E_{\text{nominal}}$

Goal:  
Deviations  
below  $10^{-4}$



■ = Value below Accuracy Limit



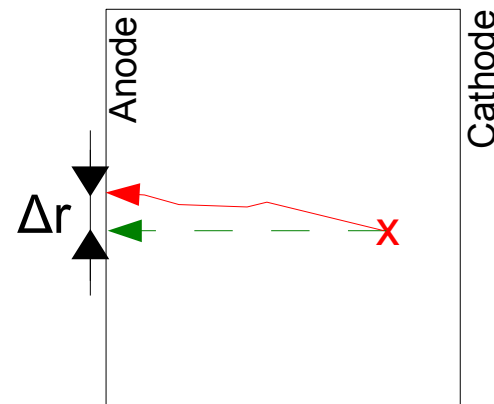
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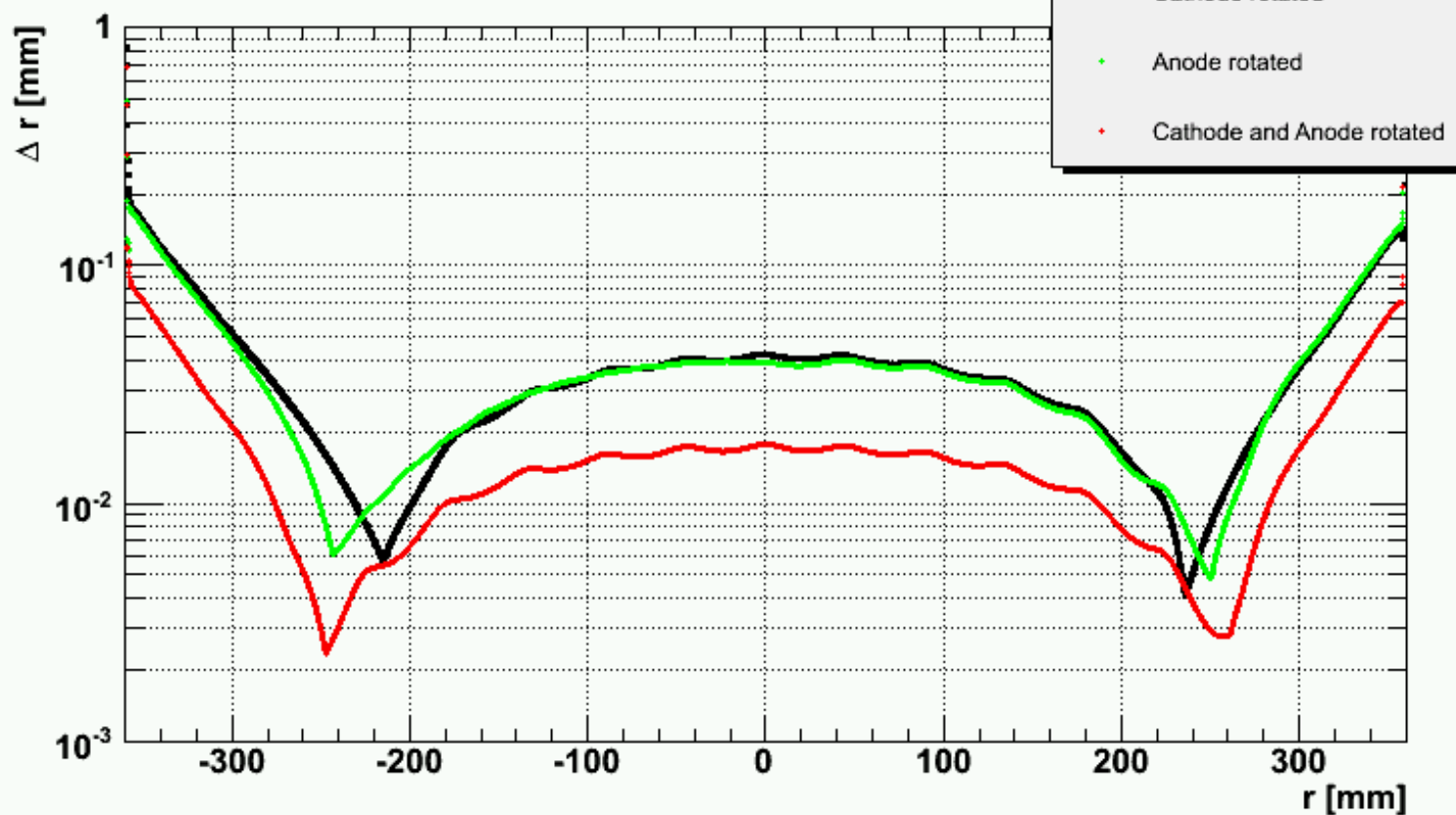


## Field Calculation: Effect without Magnetic Field

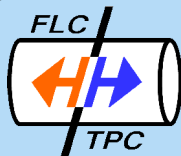
- Maximal Displacement in the central area well below  $40 \mu\text{m}$
- At the edges: up to  $100 \mu\text{m}$
- Needs to be corrected in reconstruction
- Calculation with magnetic field on the agenda

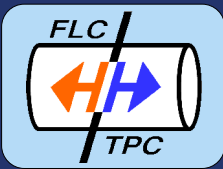


Radial displacement



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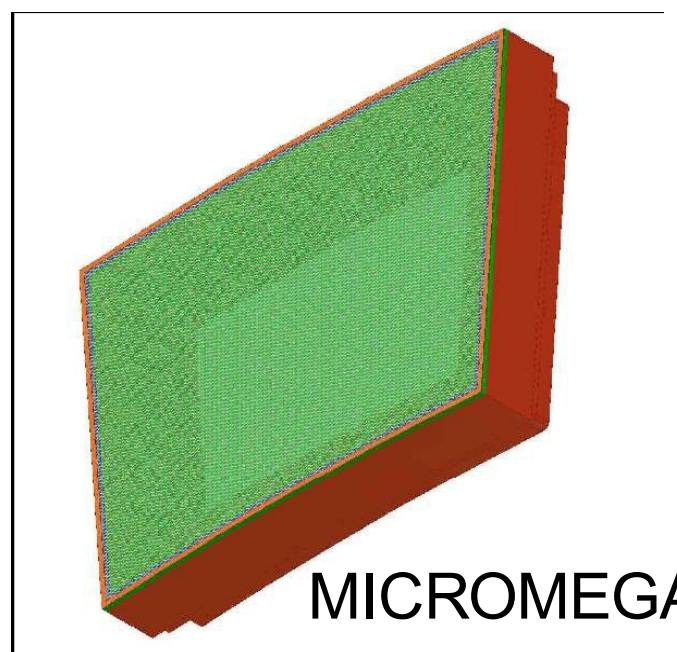
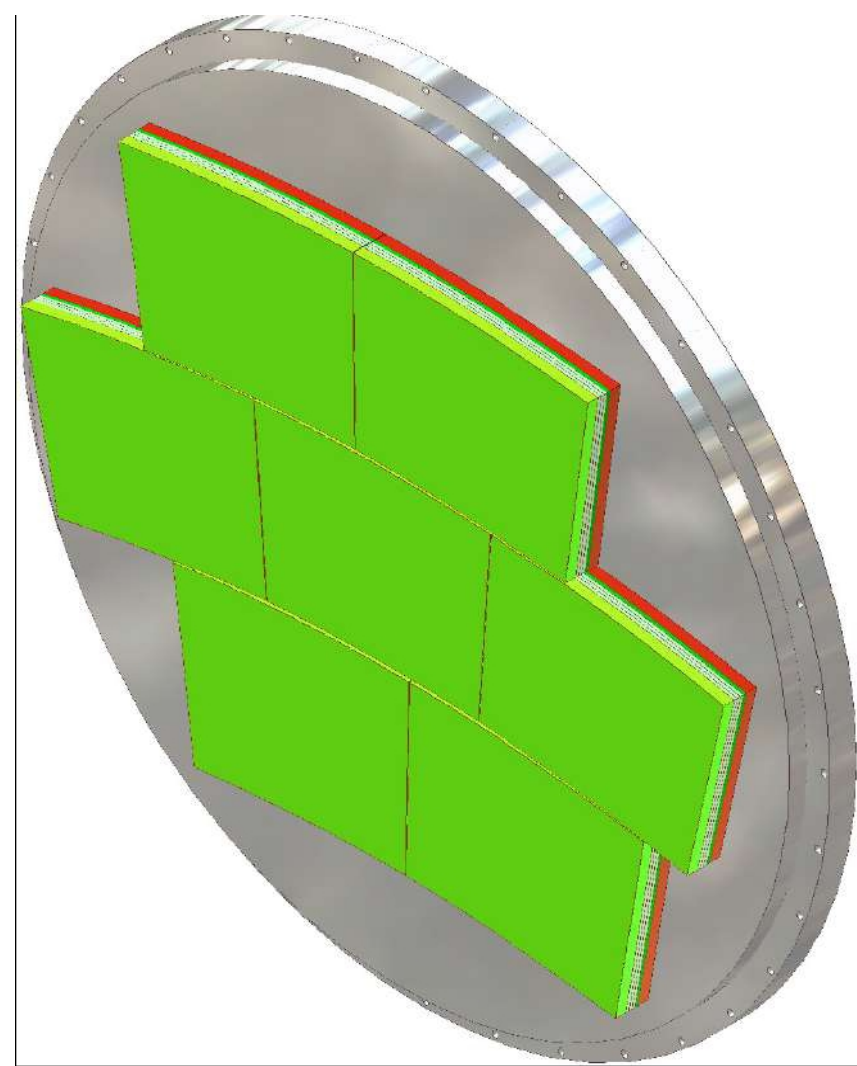




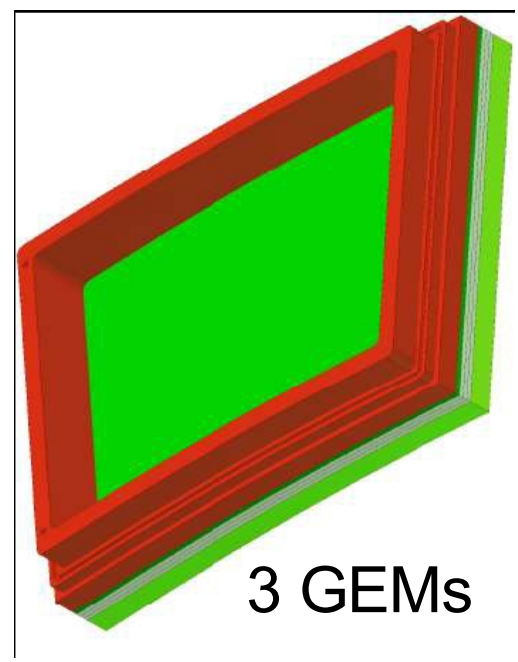
**The ILC  
Large TPC  
Prototype**

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# Modular Endplate Design (from Cornell)

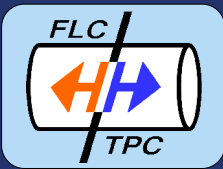


**MICROME GAS**



**3 GEMs**

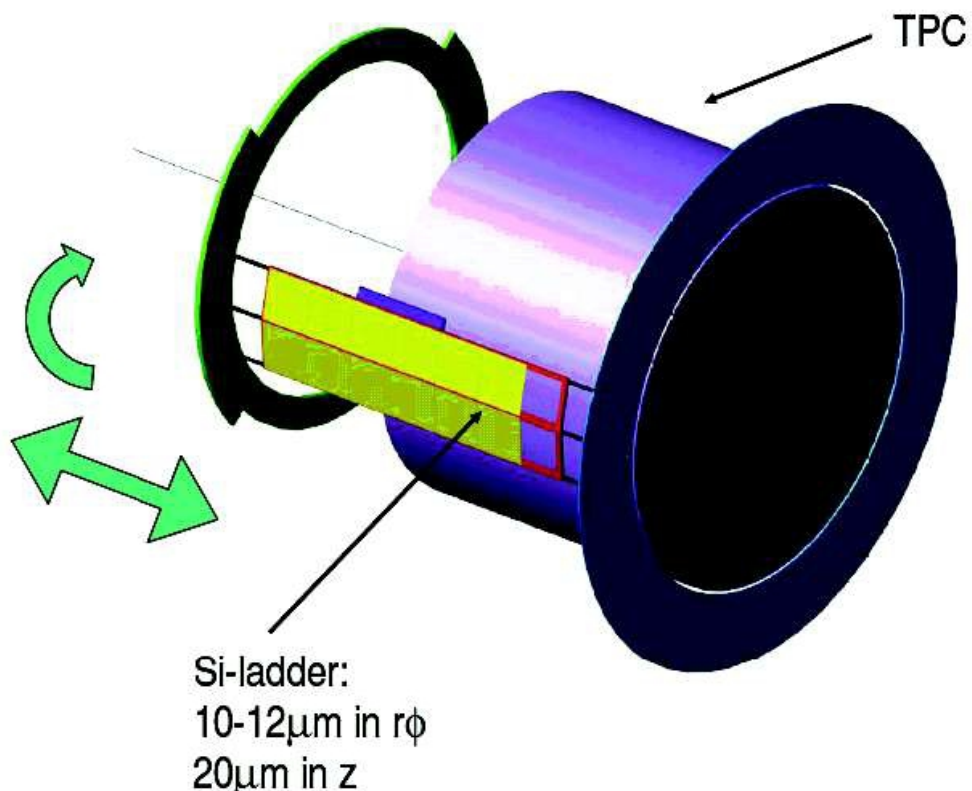
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Hamburg University



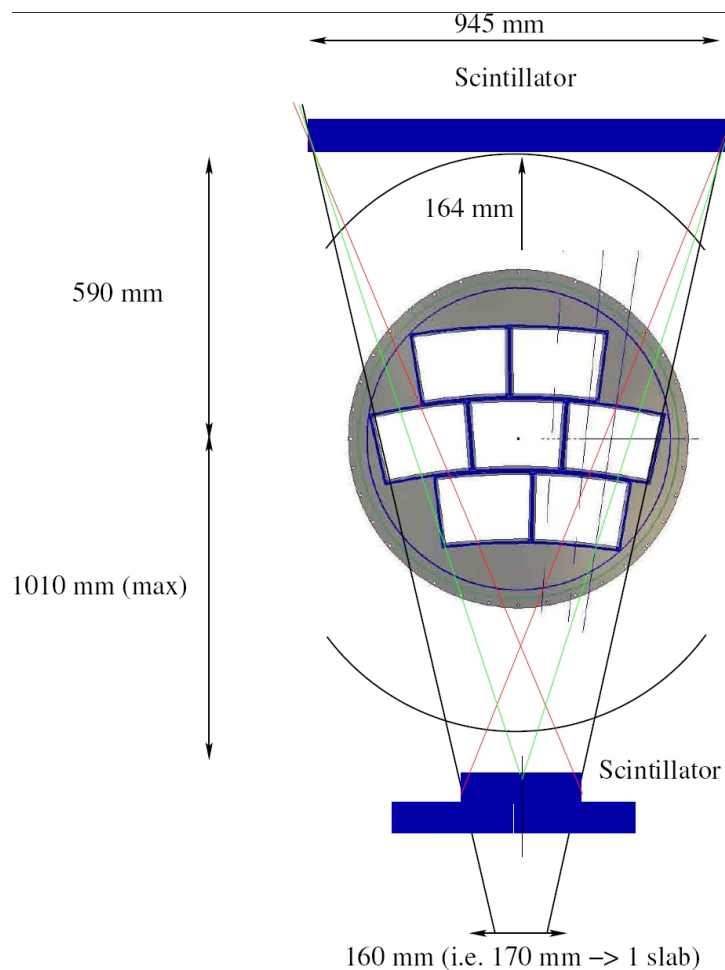
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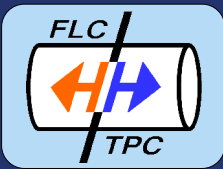
## Surroundings: Hodoscope and Trigger



- Trigger (scintillators)
  - hardware ordered
  - holding structure simple



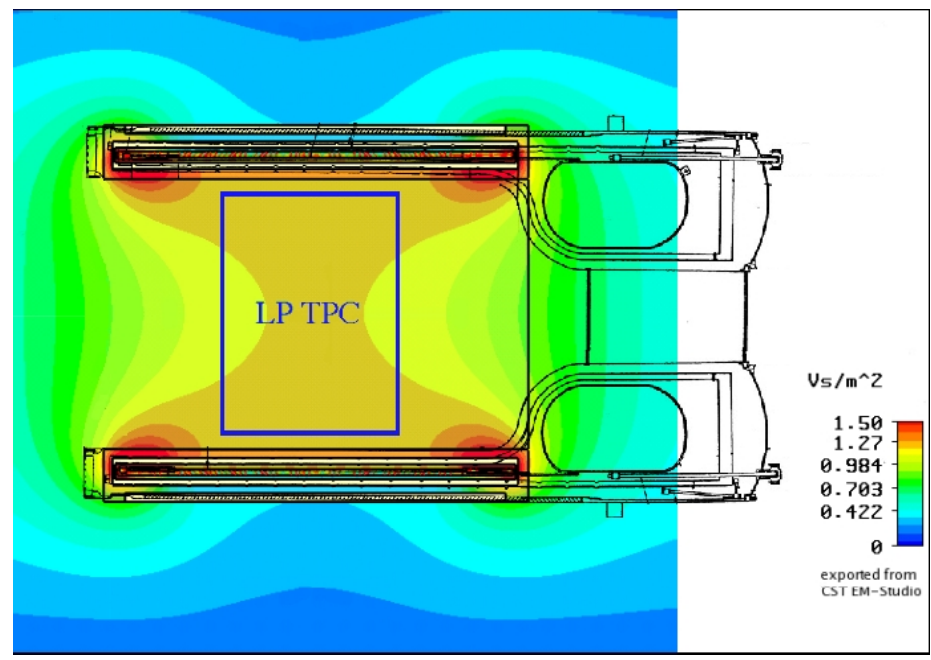
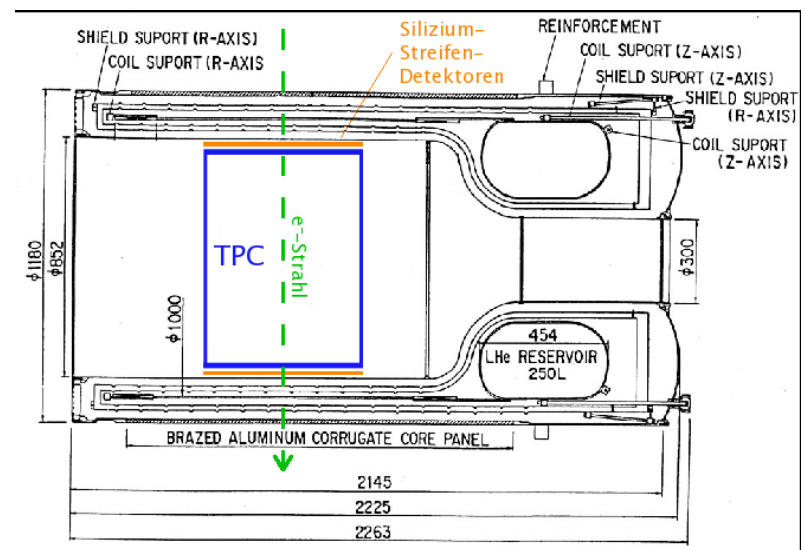
- Silicon hodoscope:
  - should be “rotatable”
  - design details of support structure still under discussion



The ILC  
Large TPC  
Prototype

# PCMAG Field Map

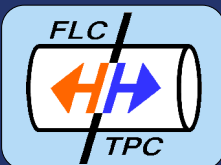
- Production of a magnet field map:
  - Measurement finished (July 07)
  - Data analysis ongoing
  - Plan: fieldmap finished by end of year or beginning of next year



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Hamburg University





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## Current Time Schedule

- 2007, mid October: Fieldstrip foil
- 2007, till end of October: soldering of resistors on foil
- 2007, till mid November: production of field cage
- 2007, November: trigger hardware in France for testing
- 2007, beginning of December: field cage at DESY
- 2007, Dec. / 2008, Jan.: magnet field map ready
- 2008, Jan./Feb.:
  - Silicon hodoscope support structure ready  
Begin of Installation
  - Trigger setup at DESY testbeam