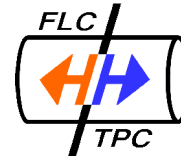


Ralf Diener
Peter Schade
Klaus Dehmelt



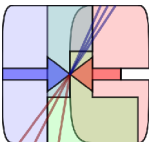
The ILC TPC Large Prototype : status and plans



Universität
Hamburg



- **Infrastructure**
- **Fieldcage**
- **Fieldstrip Foil**
- **Time Schedule**



bmb+f - Förderschwerpunkt
Elementarteilchenphysik
Großgeräte der physikalischen
Grundlagenforschung

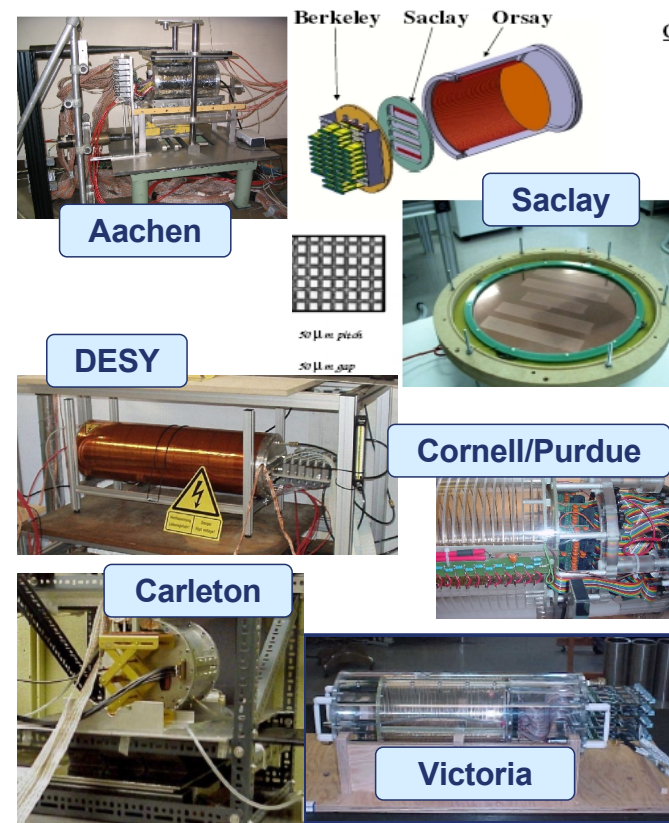


The ILC
Large TPC
Prototype

1. Introduction
2. Infrastructure
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4. Hodoscope and Trigger
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 - a) Drawings
 - b) Wall
 - c) Field
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Introduction

- Previous R&D done with small prototypes
- Now a Large Prototype is being build that will be used by many groups
- Common infrastructure
 - fieldcage and infrastructure (gas system, lifting table etc.)
 - 1T magnet and testbeam area
 - modular endplate
 - DAQ and readout electronics
 - trigger, Si hodoscope etc.
- Readout modules with different techniques from R&D groups worldwide
 - Testbeam starts mid 2008: until then a working setup has to be ready



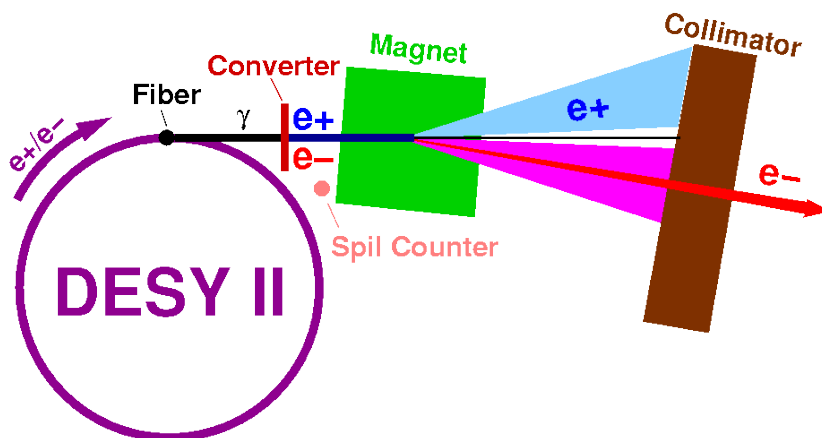


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Infrastructure at DESY

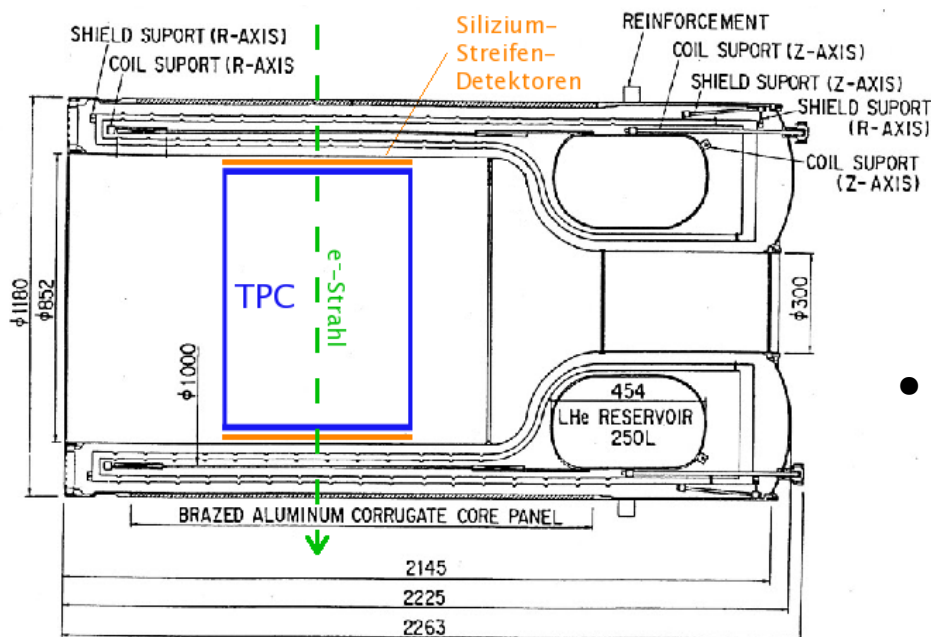
- Testbeam: electrons (1-6 GeV)



- PCMAG:

- magnetic field up to $\sim 1.25\text{T}$
- installed at DESY and successfully operated
- additional safety modifications ongoing

- Sketch of TPC prototype in PCMAG



- Lifting table will be installed



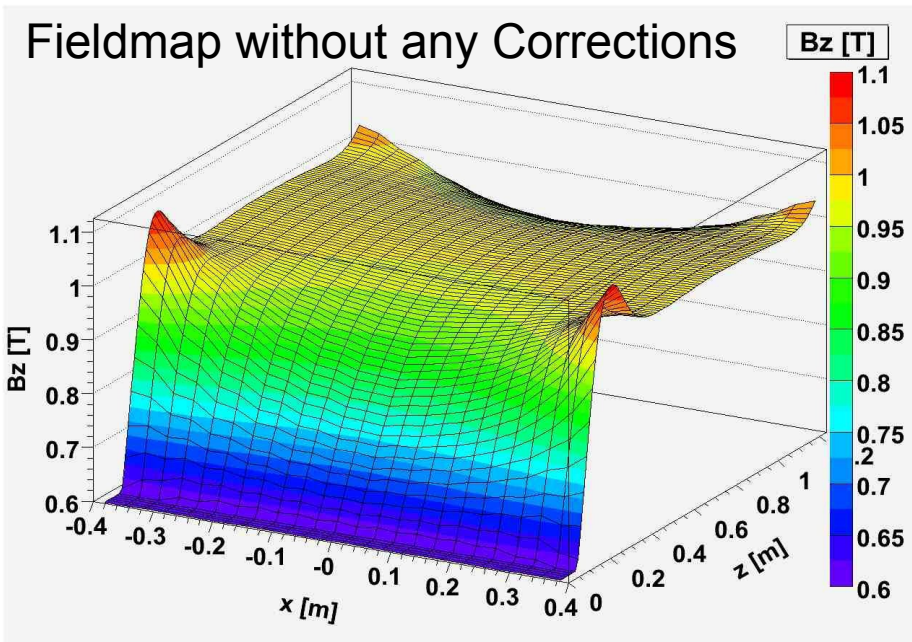
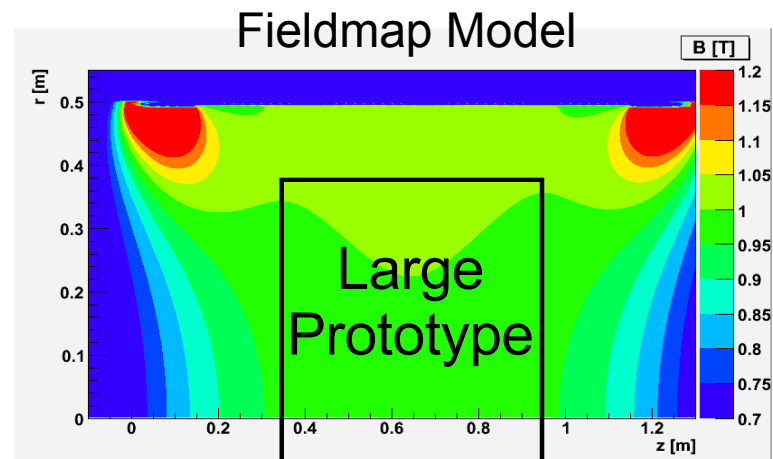


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PCMAG Field Map

- 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

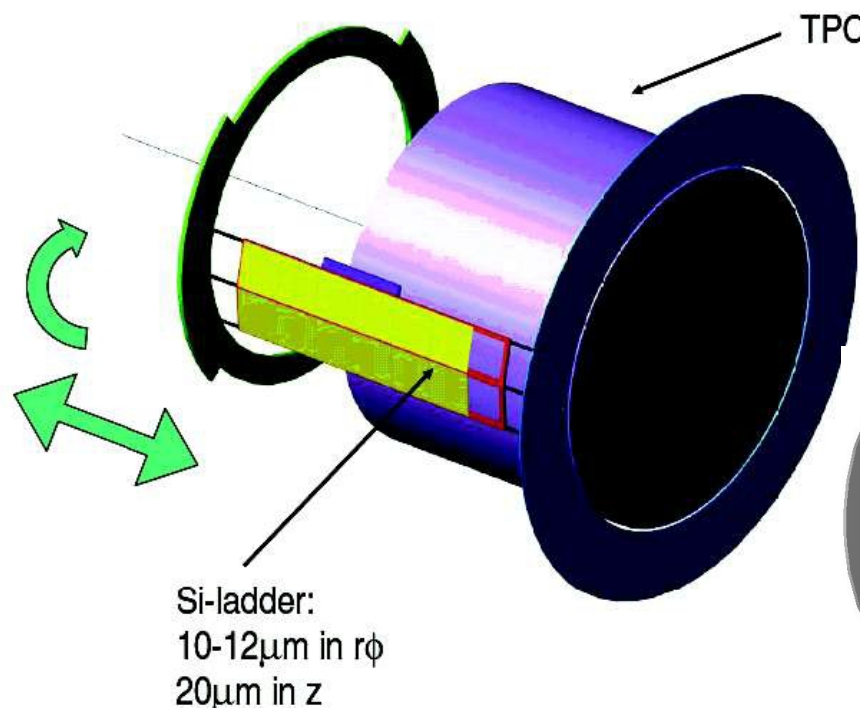




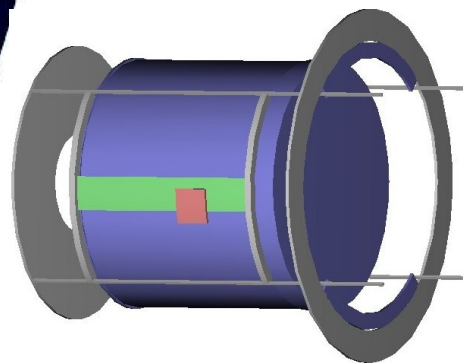
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Surroundings: Hodoscope and Trigger

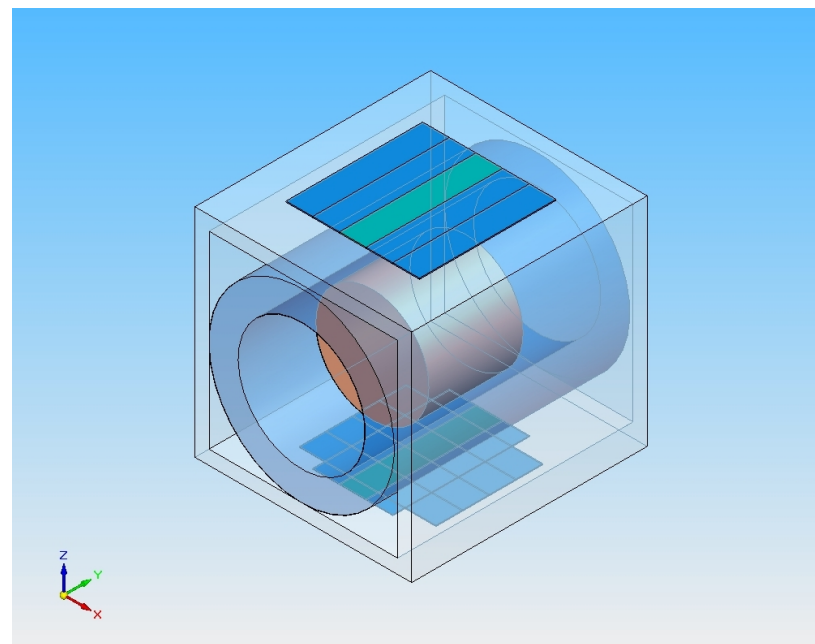


- Silicon hodoscope:
 - should be “rotatable”
 - design details of support structure still under discussion



Limited
readout area:
38.4 cm²

- Trigger (scintillators)
 - hardware ordered
 - simple holding structure
 - two perpendicular layers of slabs below the prototype

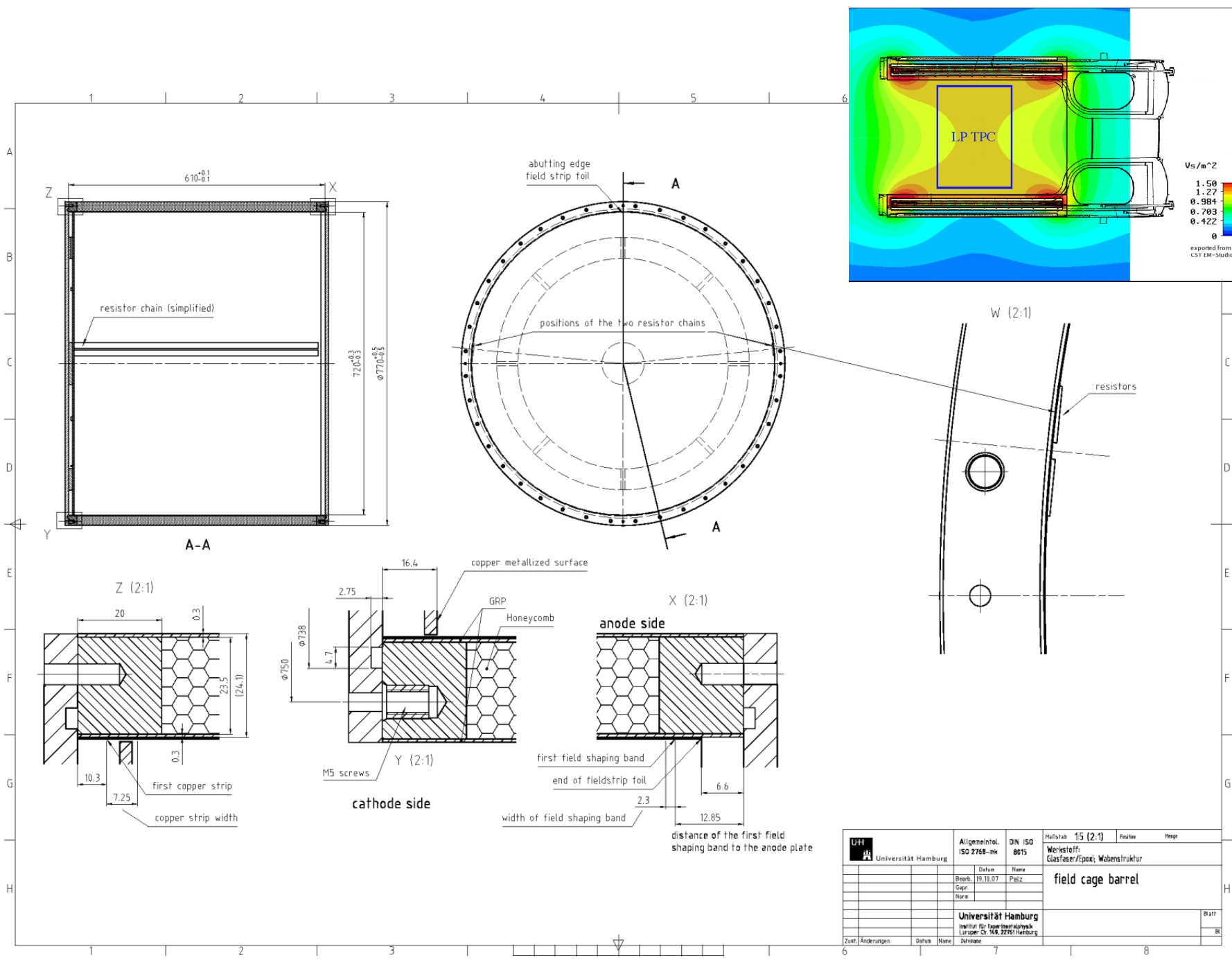


Latest Technical Drawings of LP Fieldcage



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Universität Hamburg	Allgemeintitel: ISO 2769-nk	DIN ISO 8015	Maßstab: 15 (2:1)	Folien:	Menge:
	Datum: 19.10.07	Name: Pelz	Werkstoff: Glasfaser/Epoxid; Wabenstruktur		
field cage barrel					
Universität Hamburg Institut für Experimentelle Hochphysik Luruper Ch. 149, 22761 Hamburg					
Zust.: Änderungen	Datum	Name	Vorname	7	8



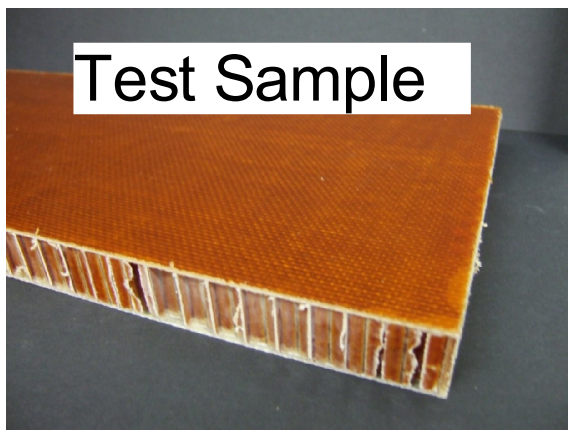


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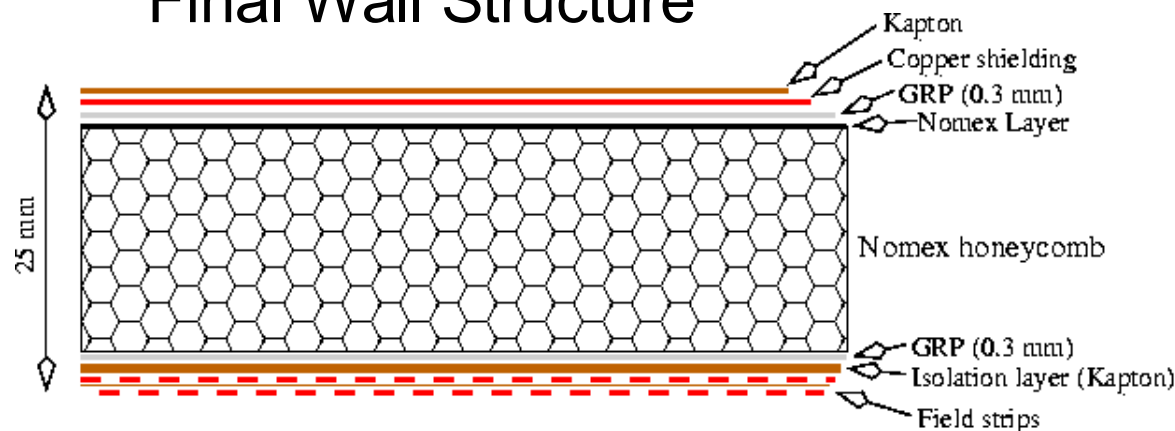
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Fieldcage Wall

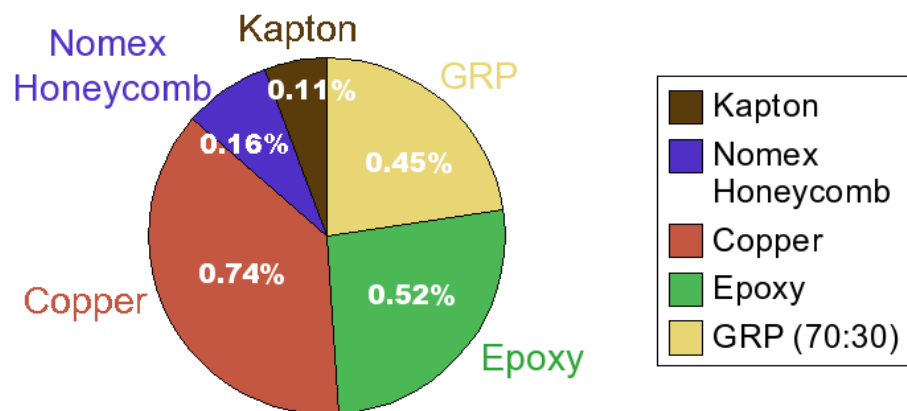
- Profile of wall:
 - shielding
 - honeycomb with GRP layers
 - field strips



Final Wall Structure



Radiation Length in % of $X_0 = 1.98\%$



- Preliminary estimation of radiation length of fieldcage wall is below 2% X_0
- LP: 4.45%
(2 walls + 72cm TDR or P5 gas)
- Final TPC: 4.85%
(2 walls + 130cm TDR or P5 gas)

Material	Rad length [cm]	Thickness	% of X_0
Kapton	28.57	4x75 μ m = 0.0300cm	0.11
Nomex Honeycomb	1430.00	2.3cm	0.16
Copper	1.43	3x 35 μ m = 0.0105cm	0.74
Epoxy	19.40	~1000 μ m = 0.1cm	0.52
GRP (70:30)	13.31	2 x 300 μ m = 0.06cm	0.45

some numbers are estimations!

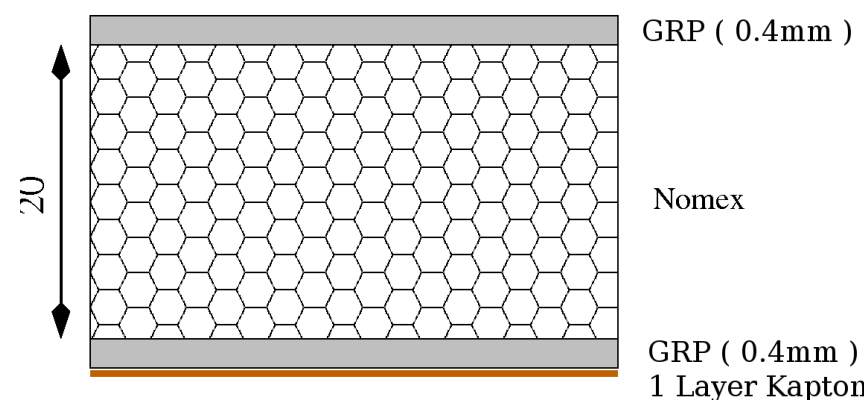
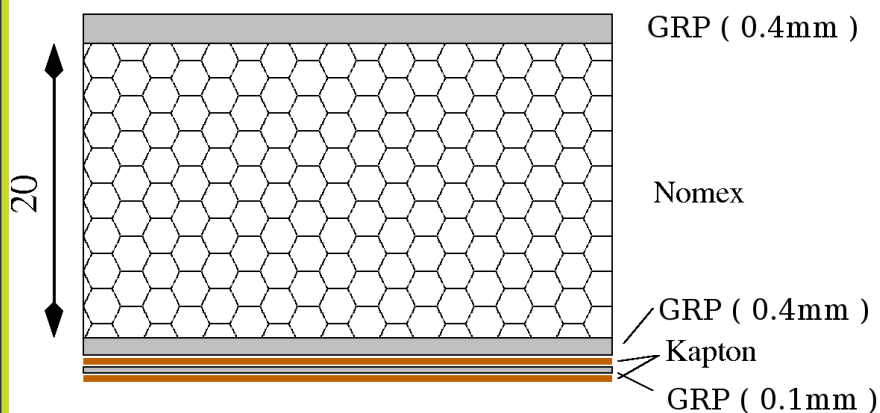
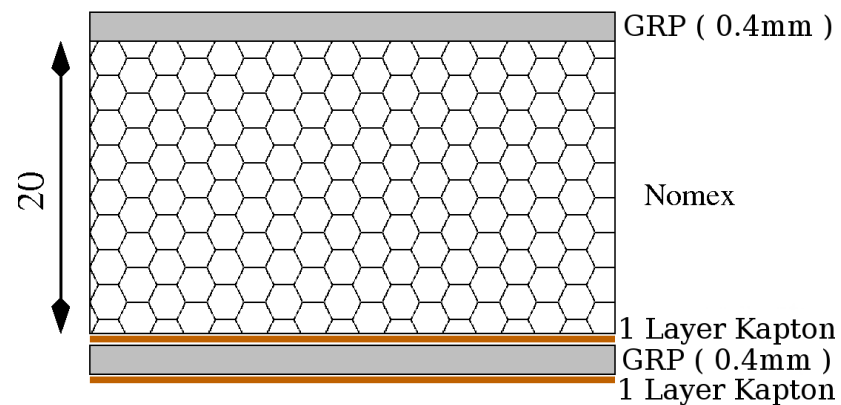
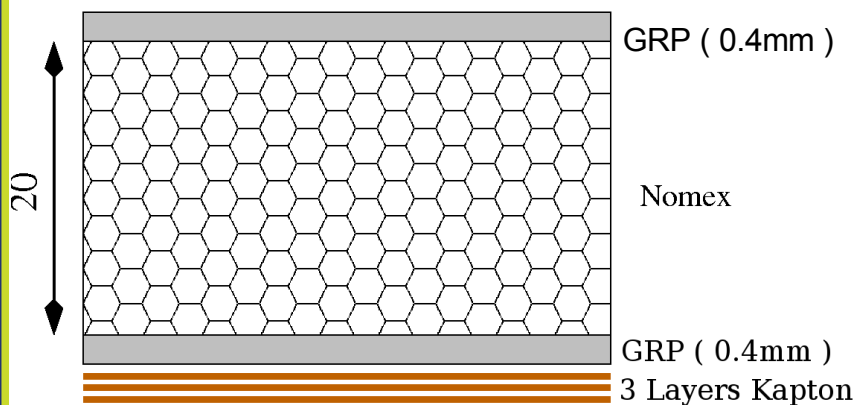


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Fieldcage Wall Test Samples

- Sample pieces with different cross sections available:
 - sufficient HV stability?
 - to test mechanical stability
 - to test manufacturing procedures

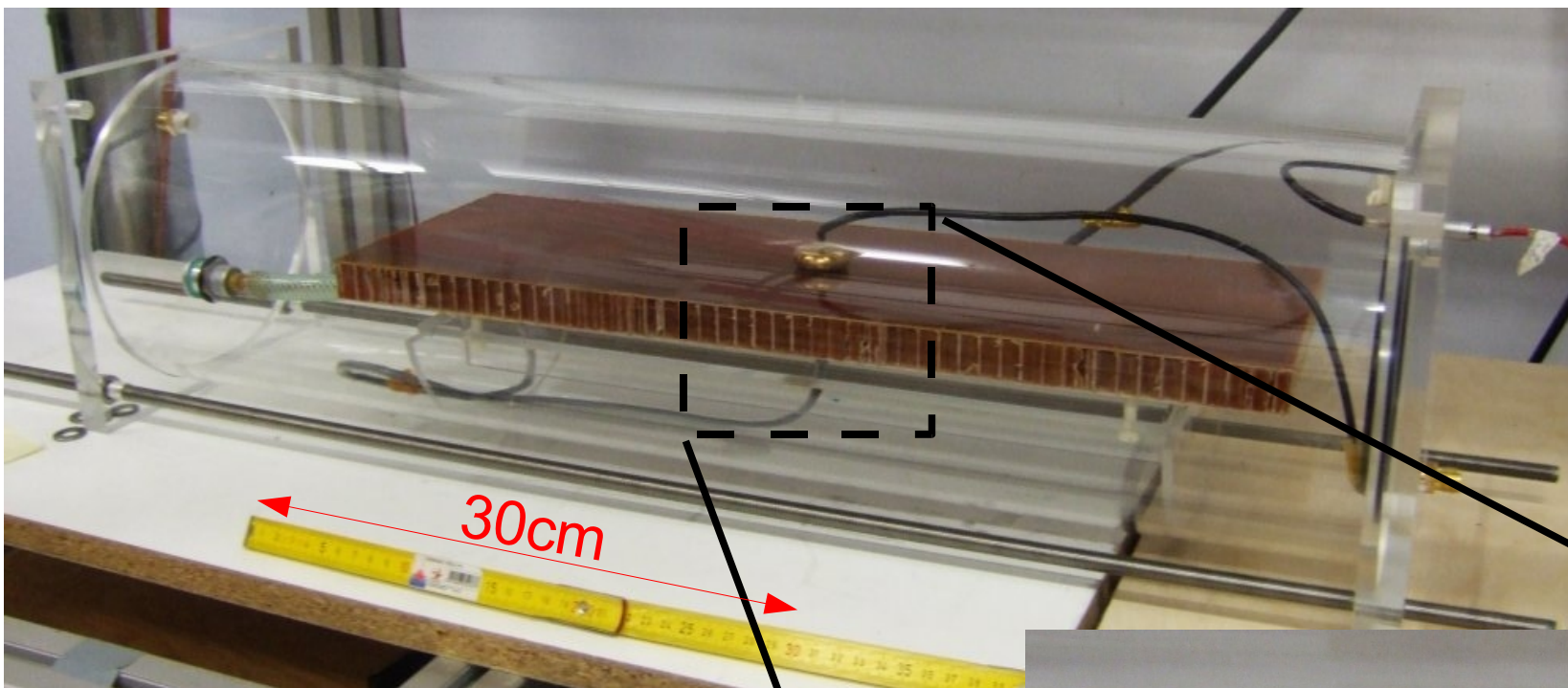




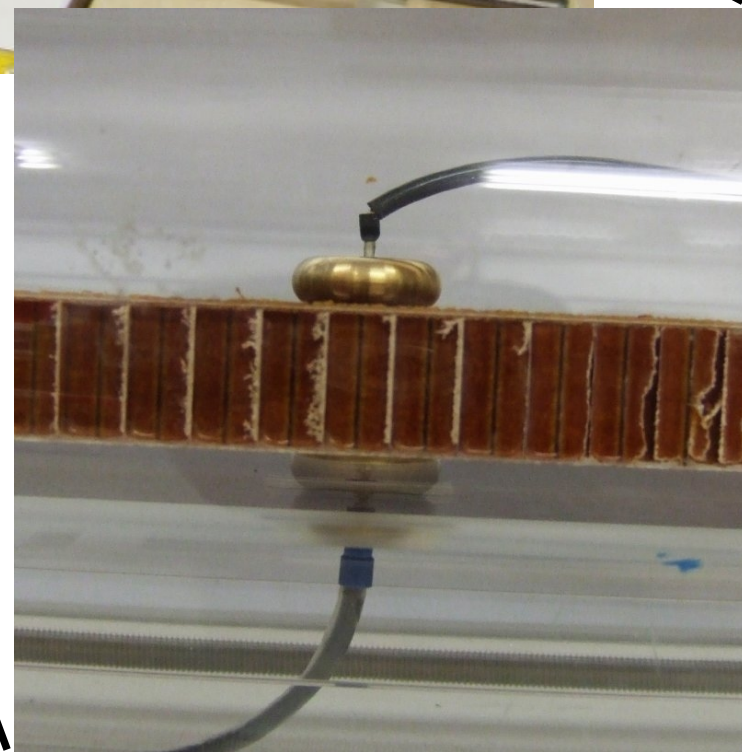
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HV Tests of Fieldcage Wall



- Each sample piece tested up to 24kV (over >24h)
- All pieces passed the test without breakdown
- Test of sample with only one Kapton layer up to 30kV also successful

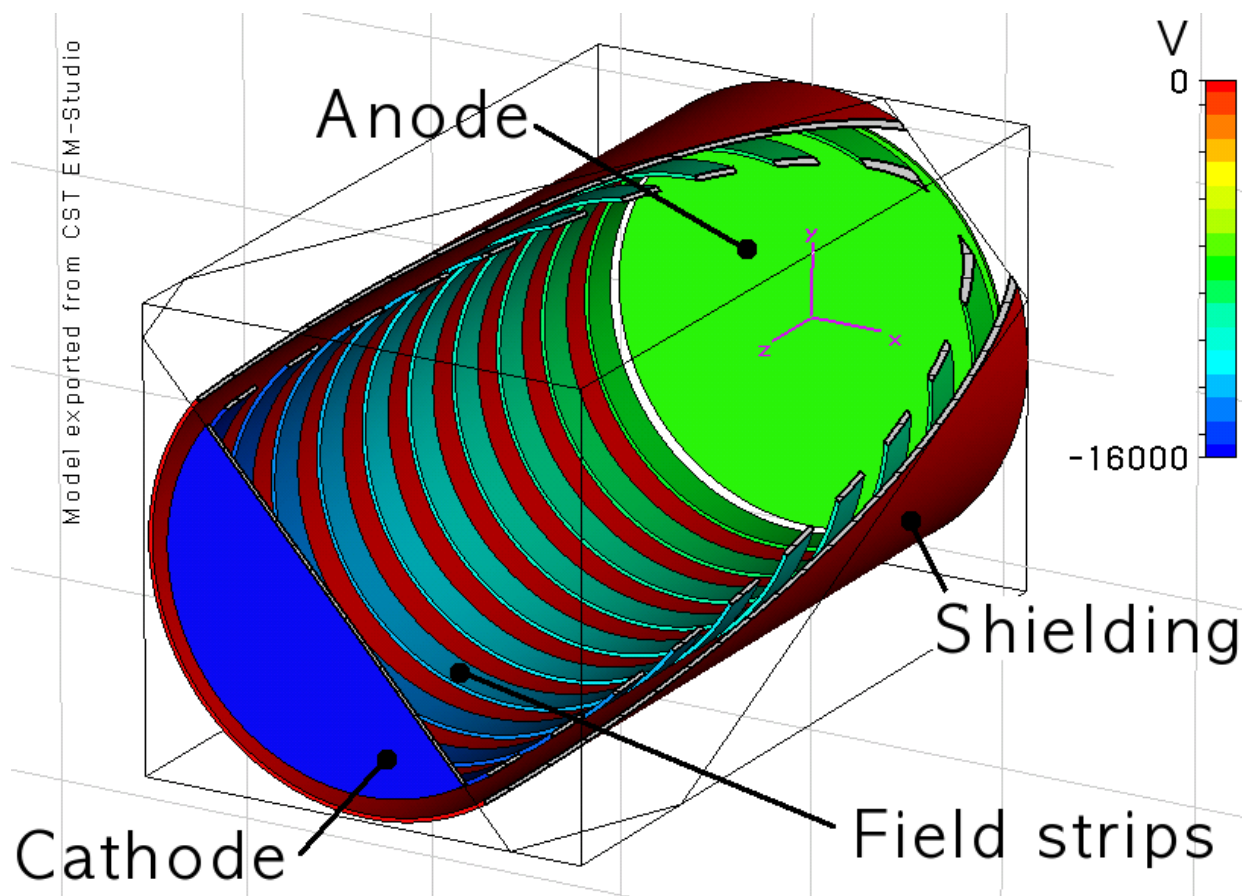




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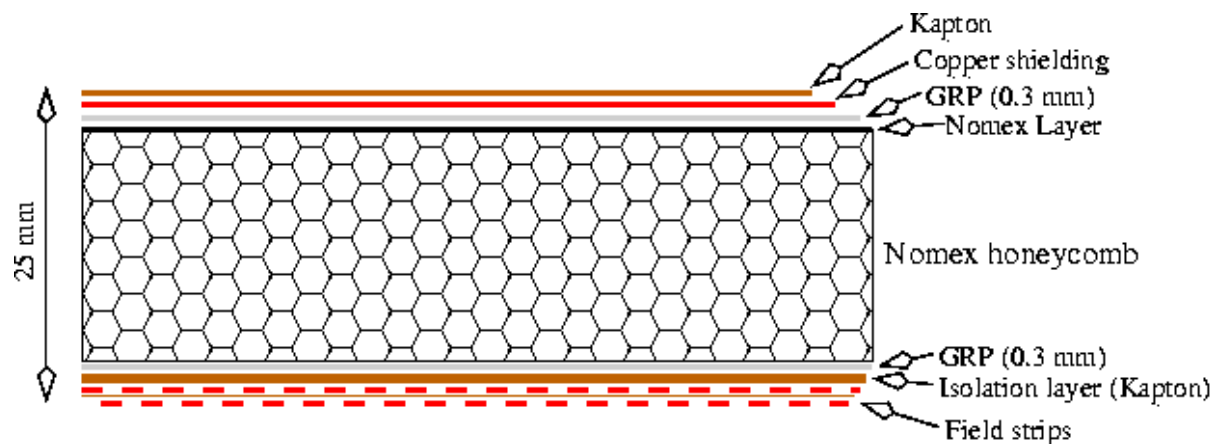
The Fieldstrip Foil



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

- Profile of wall:

- shielding
- honeycomb
- field strips

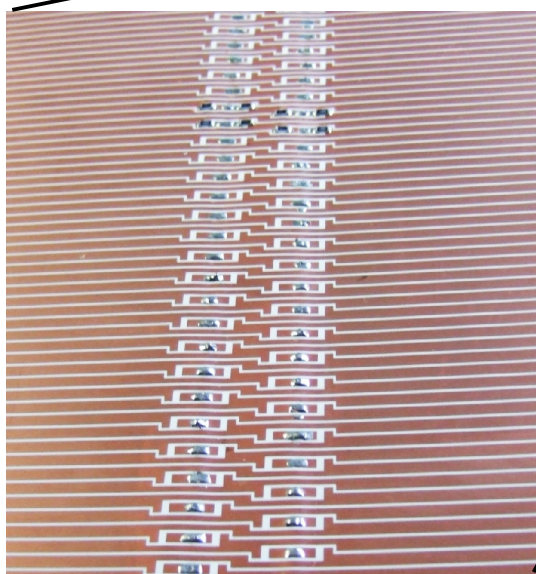
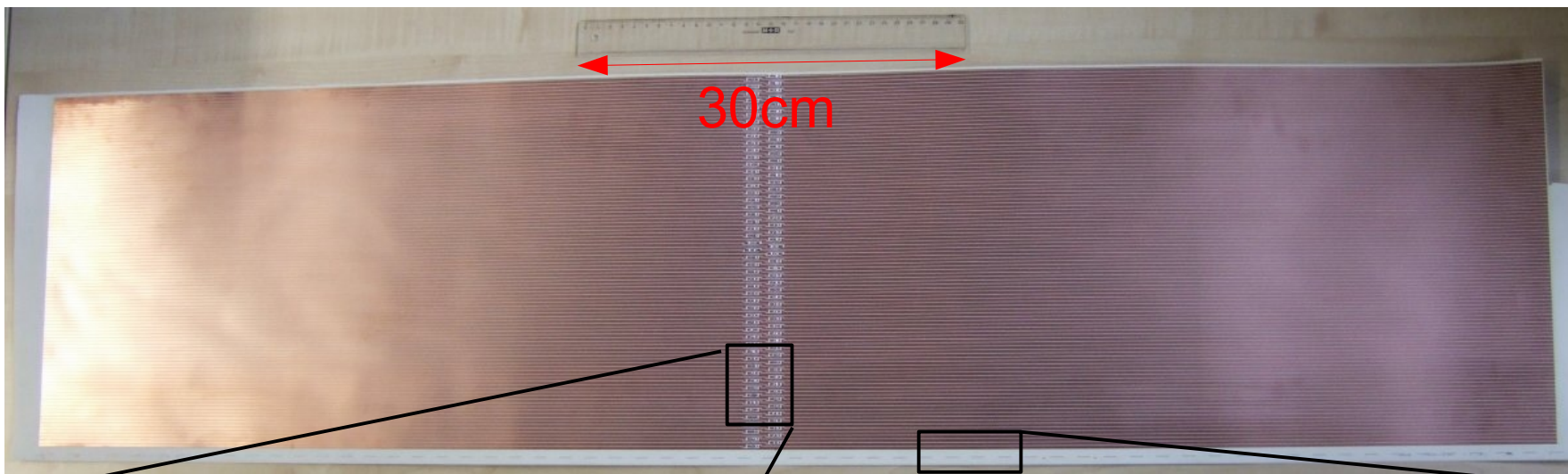




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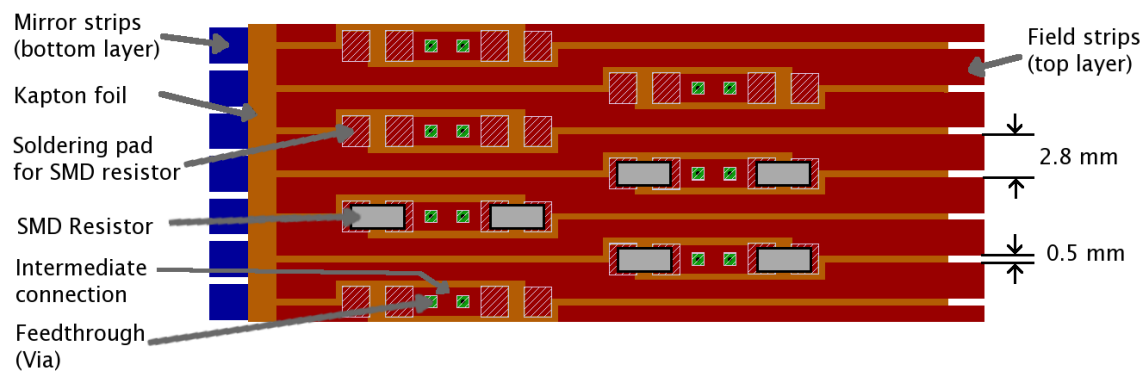
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Sample Piece of the Fieldstrip Foil



- Produced in two layers that are glued together

- ~100V between two strips possible in operation



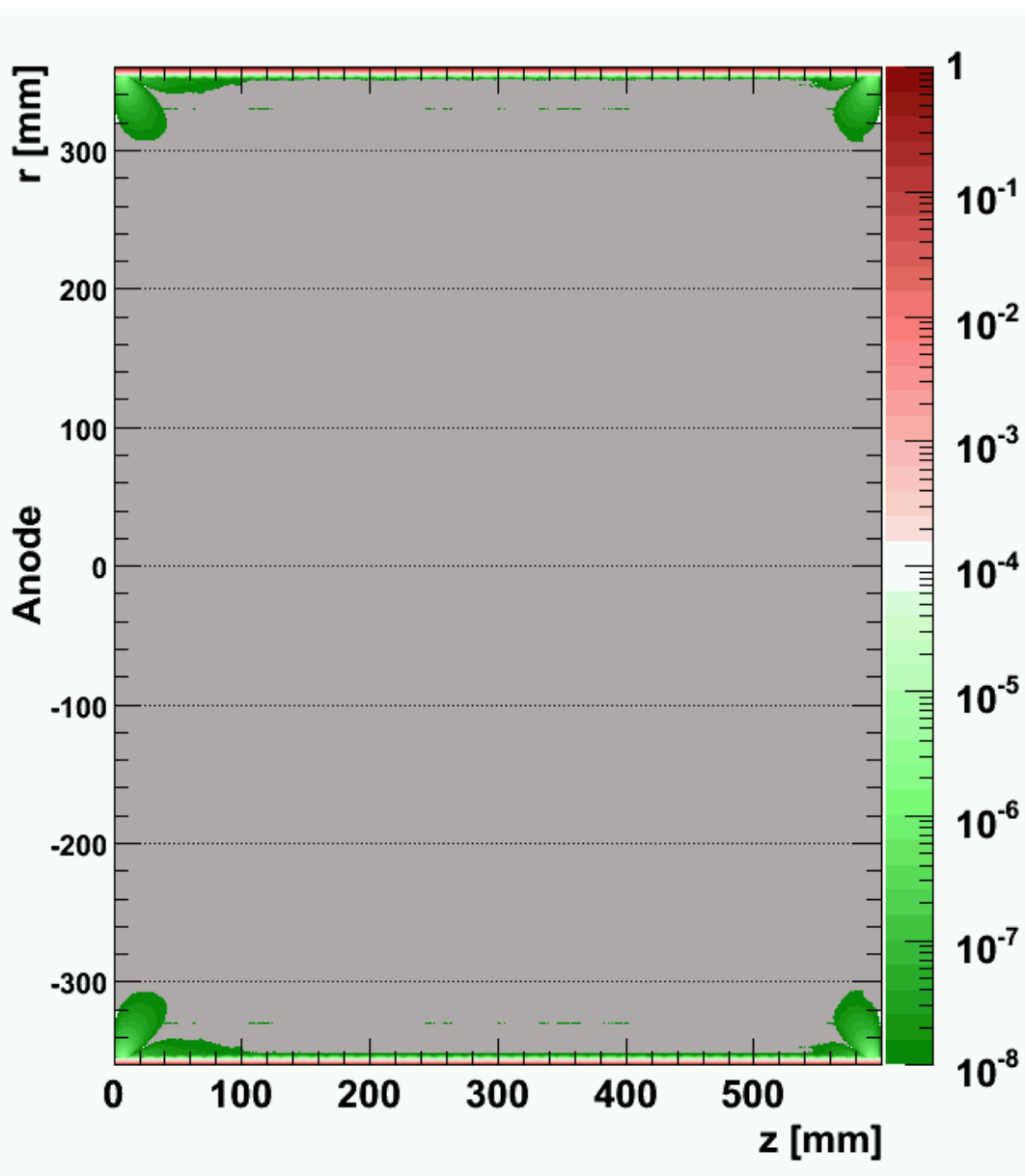


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Field Calculations

- Field Deviations with previously shown Strip Layout



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

Goal:
Deviations
below 10^{-4}

 = Value below Accuracy Limit

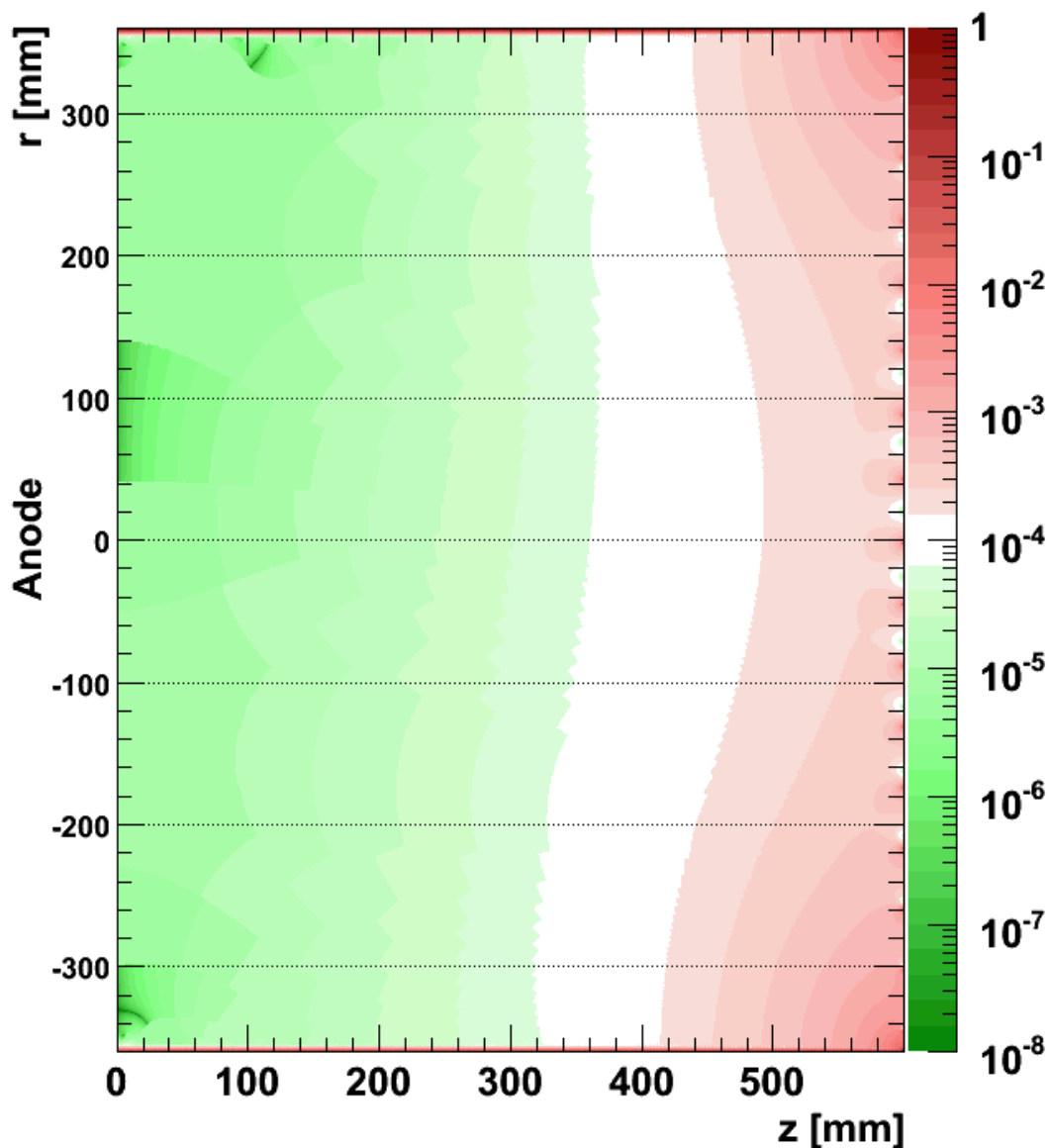


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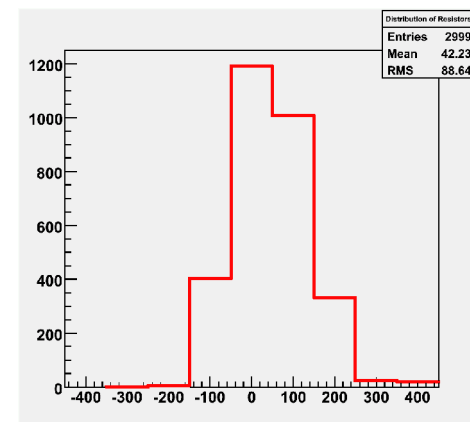
Field Calculations

- With Non-Perfect Resistors and Tilted Cathode

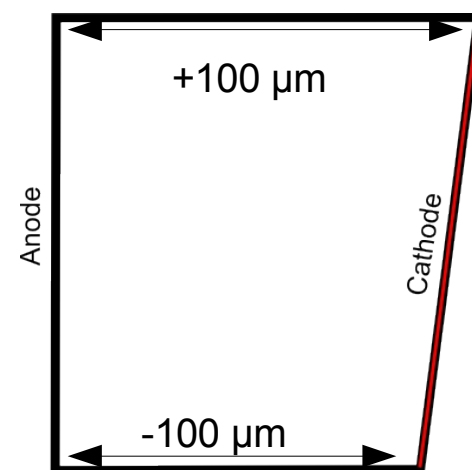


■ = Value below Accuracy Limit

Resistor distribution around nominal value :
 $1\text{M}\Omega \pm 0.2\text{‰} (=200\Omega)$
(corresponds to measured distribution)



Tilted cathode
(manufacturing accuracy)



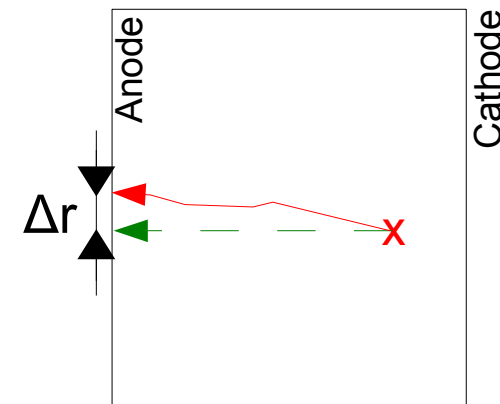


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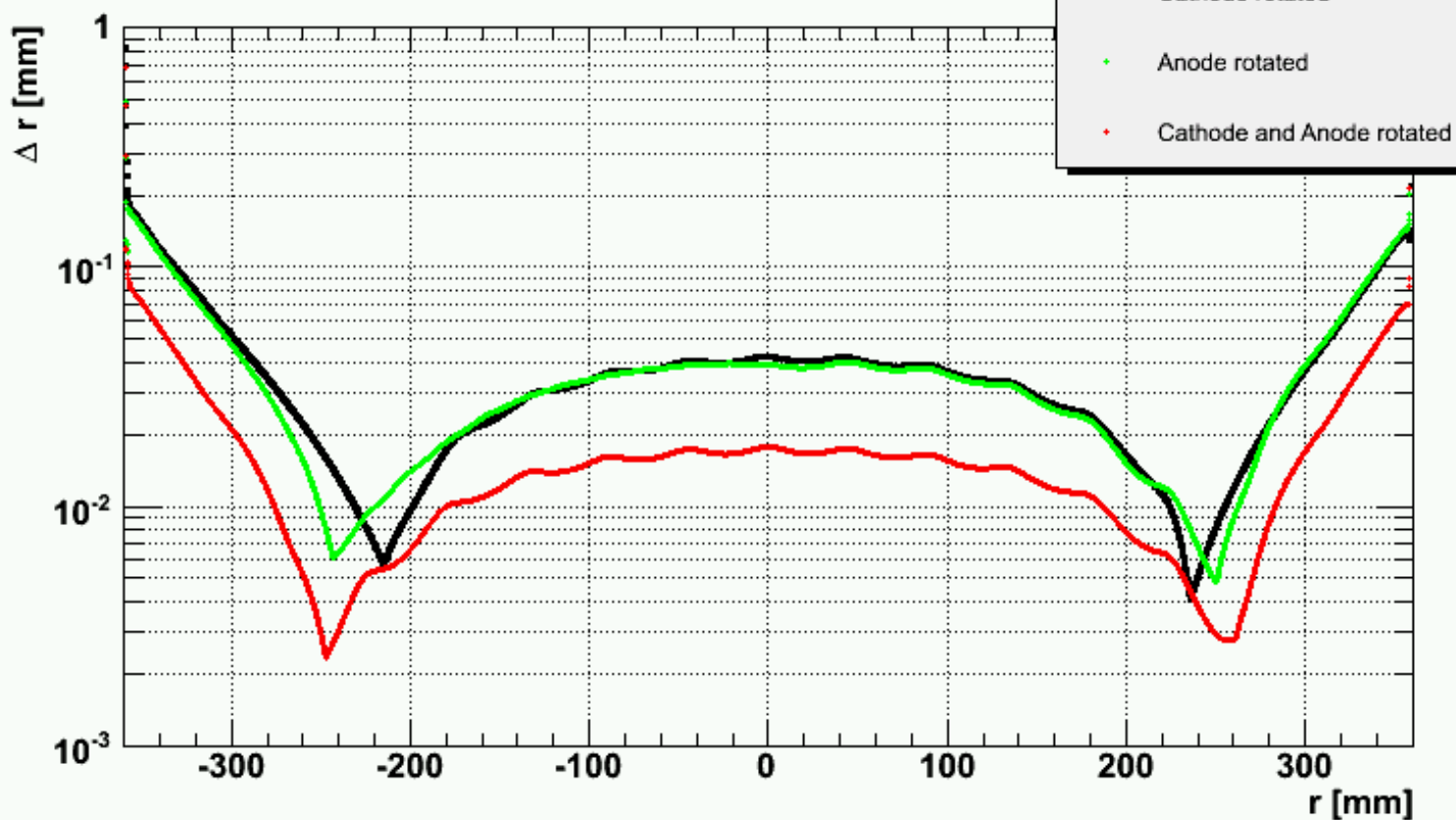
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Field Calculation: Effect without Magnetic Field

- 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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Current Time Schedule

End October (this week):
fieldstrip foil at DESY

Until end of
October: soldering
of resistors on foil

Until mid November:
production of field cage

December: simple
cathode ready

Beginning of Dec.:
field cage at DESY

Testbeam T24
starting July
2008



November: trigger
hardware in France
for testing

Jan./Feb. :Silicon hodoscope
support structure ready,
begin of installation

Jan./Feb.: Trigger setup at
DESY testbeam

Dec. / Jan.:
magnet field
map ready