



**EUDET**

Detector R&D towards the International Linear Collider



# WP5: ILD-TPC Fieldcage

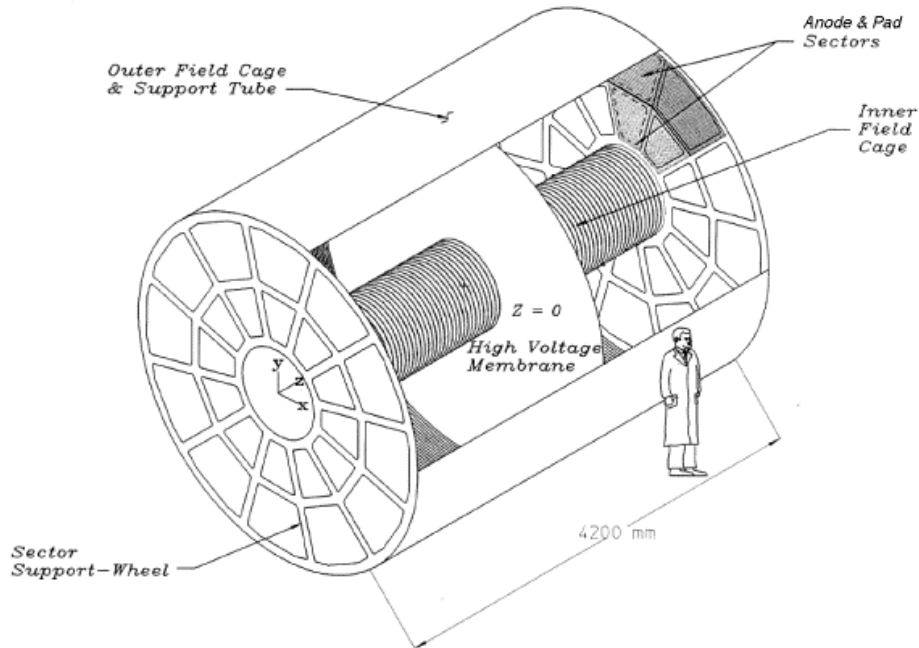
**Klaus Dehmelt  
DESY**

**WP-Meeting 103**

**April 22, 2010**

$L = 4.2 \text{ m}$   
 $ID = 1.0 \text{ m}$   
 $OD = 4.0 \text{ m}$

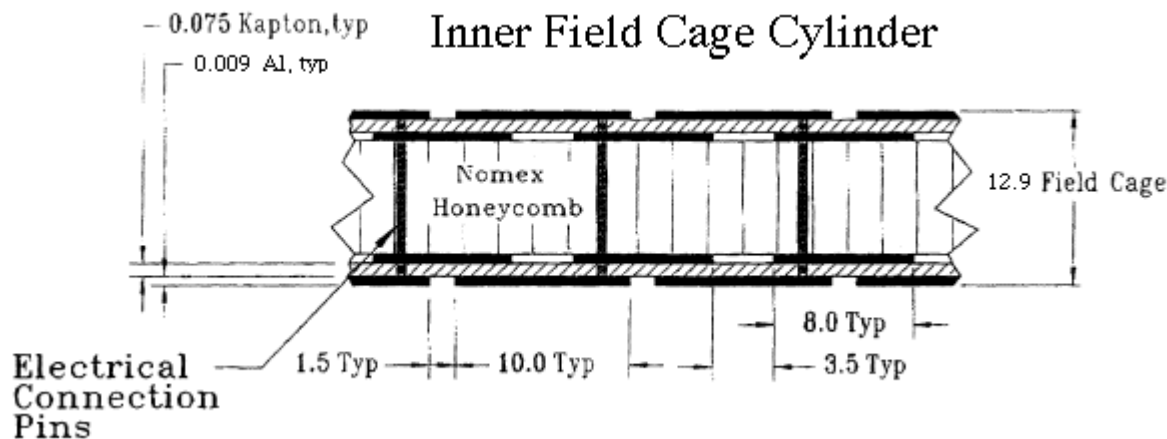
Cathode:  $70 \mu\text{m CLK}$   
 tensioned to outer  
 support hoop, mounted  
 inside OFC, no  
 mechanical coupling to  
 IFC



## IFC

Field strips: Kapton, covered w/ Al-strips  
(10+1.5 mm, 8+3.5 mm)

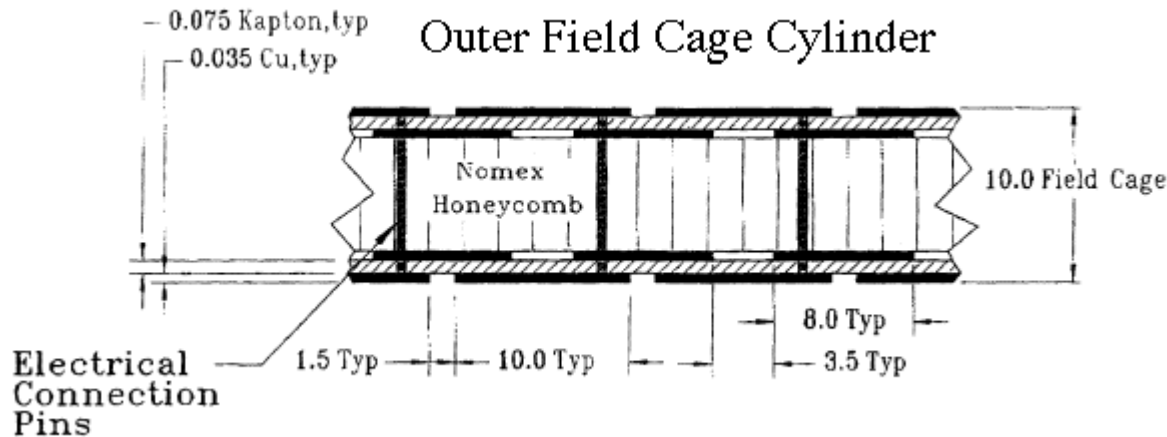
Wall : Kapton 75  $\mu\text{m}$ , Al 9  $\mu\text{m}$ ,  
HC-Nomex 12.7 mm  
thickness = 12.9 mm



## OFC

Field strips: Kapton, covered w/ Cu-strips  
(10+1.5 mm, 8+3.5 mm)

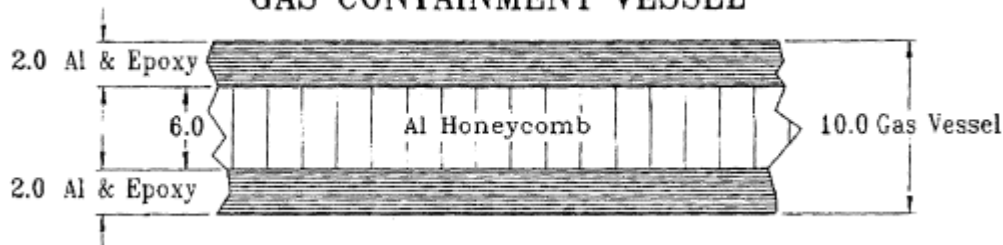
Wall : Kapton 75  $\mu\text{m}$ , Cu 35  $\mu\text{m}$ ,  
HC-Nomex 9.5 mm  
thickness = 10.0 mm



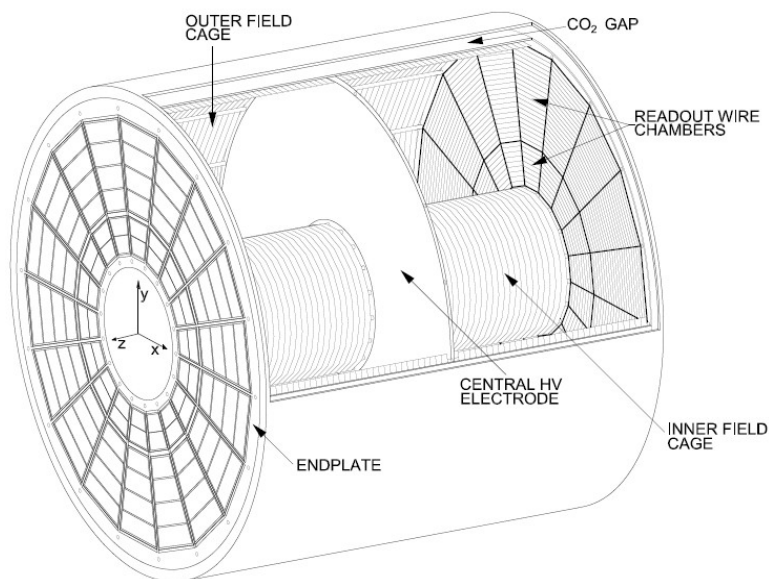
Structure	Material	Density( $g/cm^3$ )	$X_0$ ( $g/cm^2$ )	Thickness (cm)	Thickness ( $\%X_0$ )
Insulating gas	$N_2$	1.25E-03	37.99	40	0.13
TPC IFC	Al	2.700	24.01	0.004	0.04
TPC IFC	Kapton	1.420	40.30	0.015	0.05
TPC IFC	NOMEX	0.064	40	1.27	0.20
TPC IFC	Adhesive	1.20	40	0.08	0.23
IFC Total (w/gas)					0.65

Structure	Material	Density( $g/cm^3$ )	$X_0$ ( $g/cm^2$ )	Thickness (cm)	Thickness ( $\%X_0$ )
TPC gas	P10	1.56E-03	20.04	150.00	1.17
TPC OFC	Cu	8.96	12.86	0.013	0.91
TPC OFC	Kapton	1.420	40.30	0.015	0.05
TPC OFC	NOMEX	0.064	40	0.953	0.15
OFC	Adhesive	1.20	40	0.05	0.15
OFC Total (w/gas)					2.43

## GAS CONTAINMENT VESSEL



Adds another 14% !!!

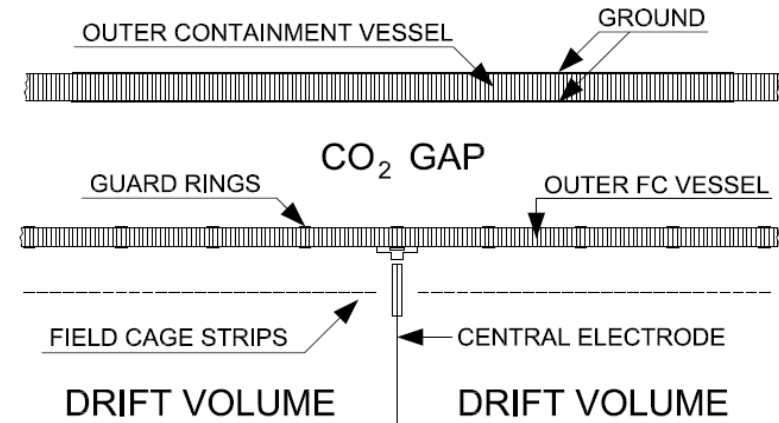
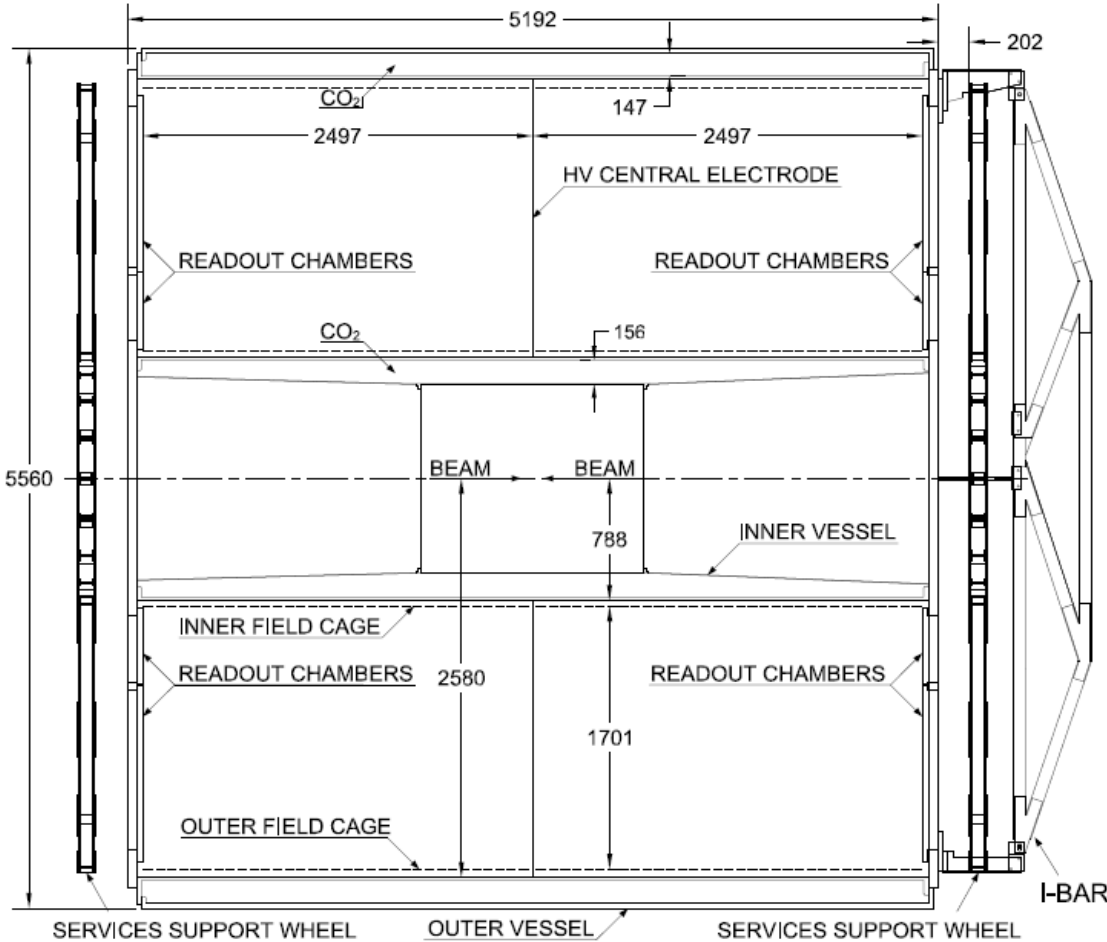


$L = 5.0 \text{ m}$   
 $ID = 0.85 \text{ m}$   
 $OD = 5.0 \text{ m}$

Cathode: 23  $\mu\text{m}$  aluminized Mylar, three foils were glued together w/ 50 mm wide Mylar bands over the joints, tensioned to inner and outer rims, second set of rims on the other side, mounted inside OFC







Part	$X/X_0$ [%]
Central drum	0.470
Inner CO <sub>2</sub> gap	0.085
Inner field cage vessel	0.401
Inner field cage strip	0.012
Inner field cage total	0.968
Drift gas	0.607
Outer field cage strip	0.012
Outer field cage vessel	0.401
Outer CO <sub>2</sub> gap	0.081
Outer containment vessel	1.330
Outer field cage total	1.824

$L = 4.3 \text{ m}$   
 $ID = 0.4 \text{ m}$   
 $OD = 3.6 \text{ m}$

Field cage is also gas vessel;  
 “Play” with sandwich in order  
 to get the mechanical/HV-  
 stability and the least amount  
 of material;  
 think about cathode design  
 similar to STAR/ALICE  
 → contacted STAR person  
 regarding HV feed

Radiation Length: 1.31% of  $X_0$

