SiD Engineering Design for the LOI

Kurt Krempetz

SiD Engineering Group Participates

Engineers	Physicists
ANL	
• Victor Guarino→Hcal	
FNAL	
• Bob Wands→FEA	Bill Cooper
• Kurt Krempetz→Integration	
• Walter Jaskierny→Solenoid Electrical	
LAPP	
• Claude Girard	Yannis Karyotakis
• Franck Cadoux	
• Nicolas Geffroy→Hcal	
LLNL	
•	Doug Wright
PSL	
• Farshid Feyzi→Muon Steel	
SLAC	
• Jim Krebs→EndDoors	Marty Breidenbach
• Marco Oriunno→Ecal	Tom Markiewicz
• Wes Craddock→Solenoid	Takaski Maruyama
RAL	
• Andy Nichols→Tracking	Phil Burrows
U of Texas, Arlington	
•	Andy White

SiD Engineering Tools

Lab	CAD	Mechanical Analysis	Magnet Analysis
Argonne	Inventor SolidWorks	ANSYS SAP2000	ANSYS
Fermilab	IDEAS AutoCad Inventor SolidWorks	IDEAS ANSYS	ANSYS
LAPP	CATIA V5	Samcef	
SLAC	Solid Edge AutoCAD Inventor	ANSYS	ANSYS

- For the sharing data currently we are using ILCDOC.

ILC Document Server

- **Web Address: http://ilcdoc.linearcollider.org/**

Currently in SiD Engineering:

1. **Proposal of a new Hcal geometry avoiding cracks in the calorimeter**

2. **Plan and Elevation View of SiD to document global parameters for the letter of intent**

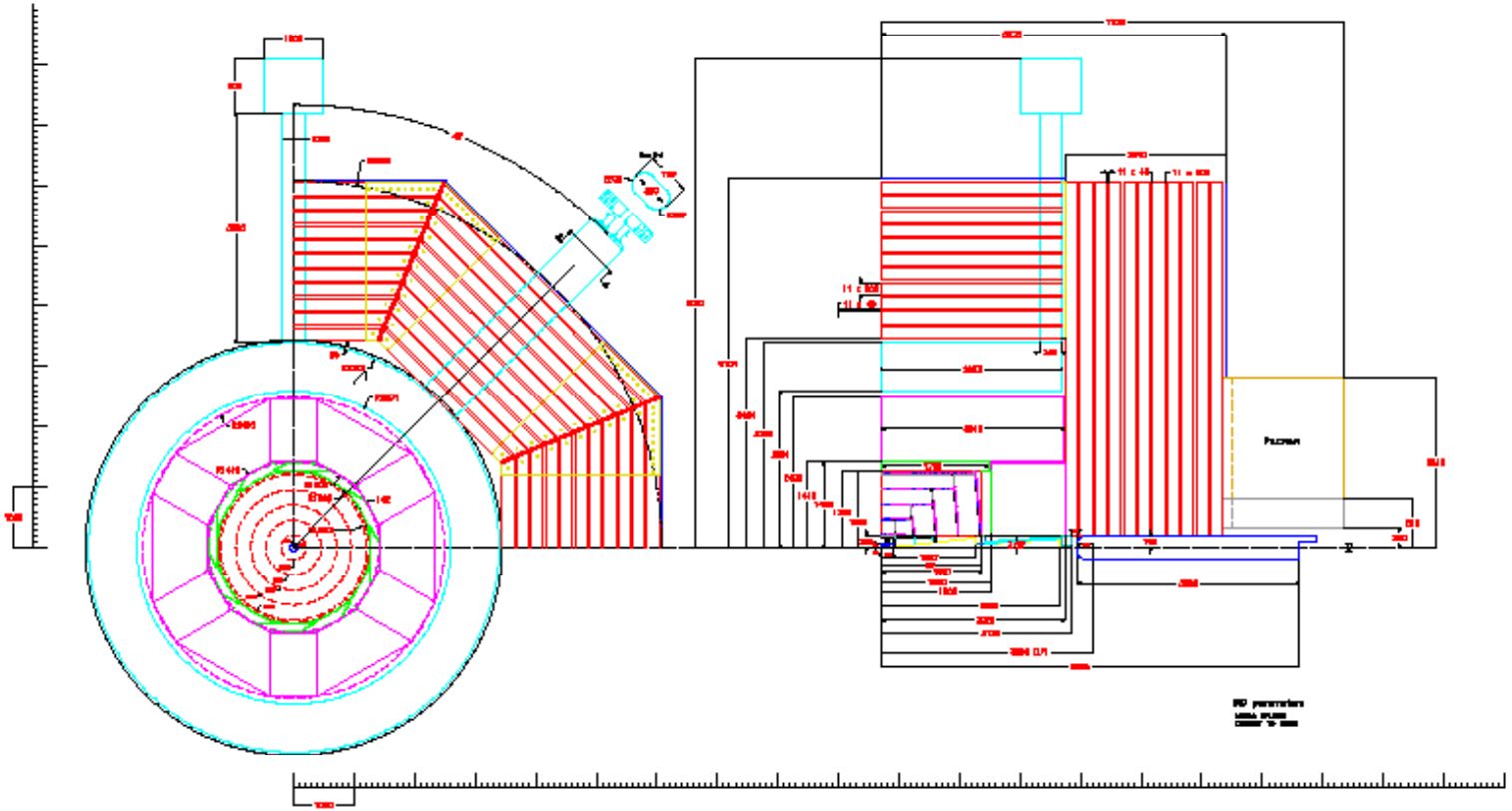
Global Parameters

Engineering Design

Simulation-SiD02 ( )

Detector		Radius (m)			Axial (z) (m)	
		Min	Max		Min	Max
Vertex Detector		0.014	0.060		0.000	0.180
Central Tracking		0.206	1.250		0.000	1.607
Barrel Ecal	(1.27)	1.265	1.409		0.00	1.765 (1.68)
Endcap Ecal	(.26)	0.206	1.250		1.657	1.800 (1.82)
Barrel Hcal	(1410)	1.419	2.493		0.000	3.018
Endcap Hcal	(.26)	0.206	1.404	(1.82)	1.806	3.028
Coil	(2.55)	2.591	3.392		0.000	3.028
Barrel Iron	(338.8)	3.442	6.082		0.000	3.033 (2.94)
Endcap Iron	(.26)	0.206	6.082		3.033	5.673

Global Parameters

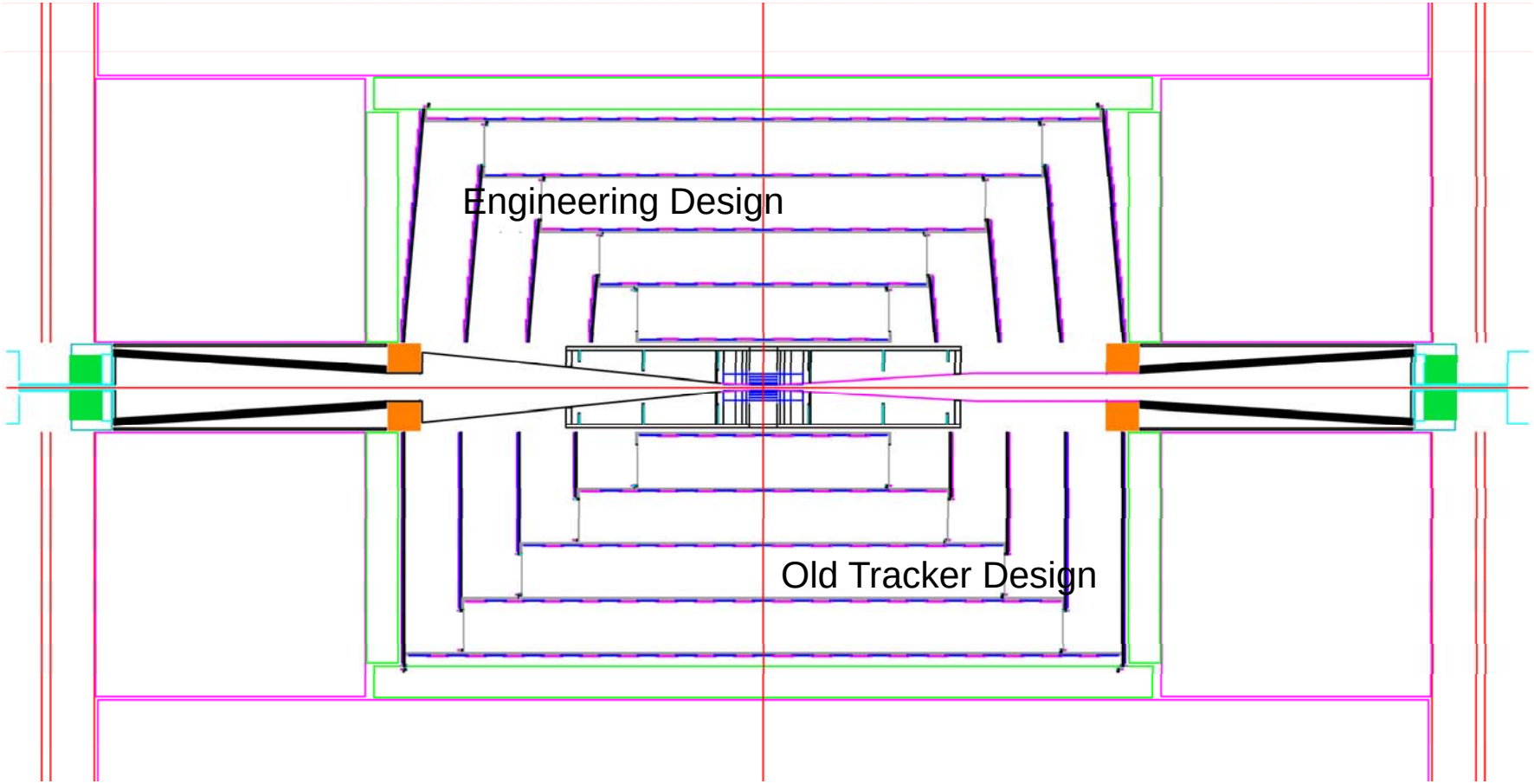


Tracker Engineering Design

- **Conical Beam Tube to out to Lumi-Cal***
- **5 – Barrels**
- **4 - Conical Disk***
- **No cracks**

- * -not address SiD 02

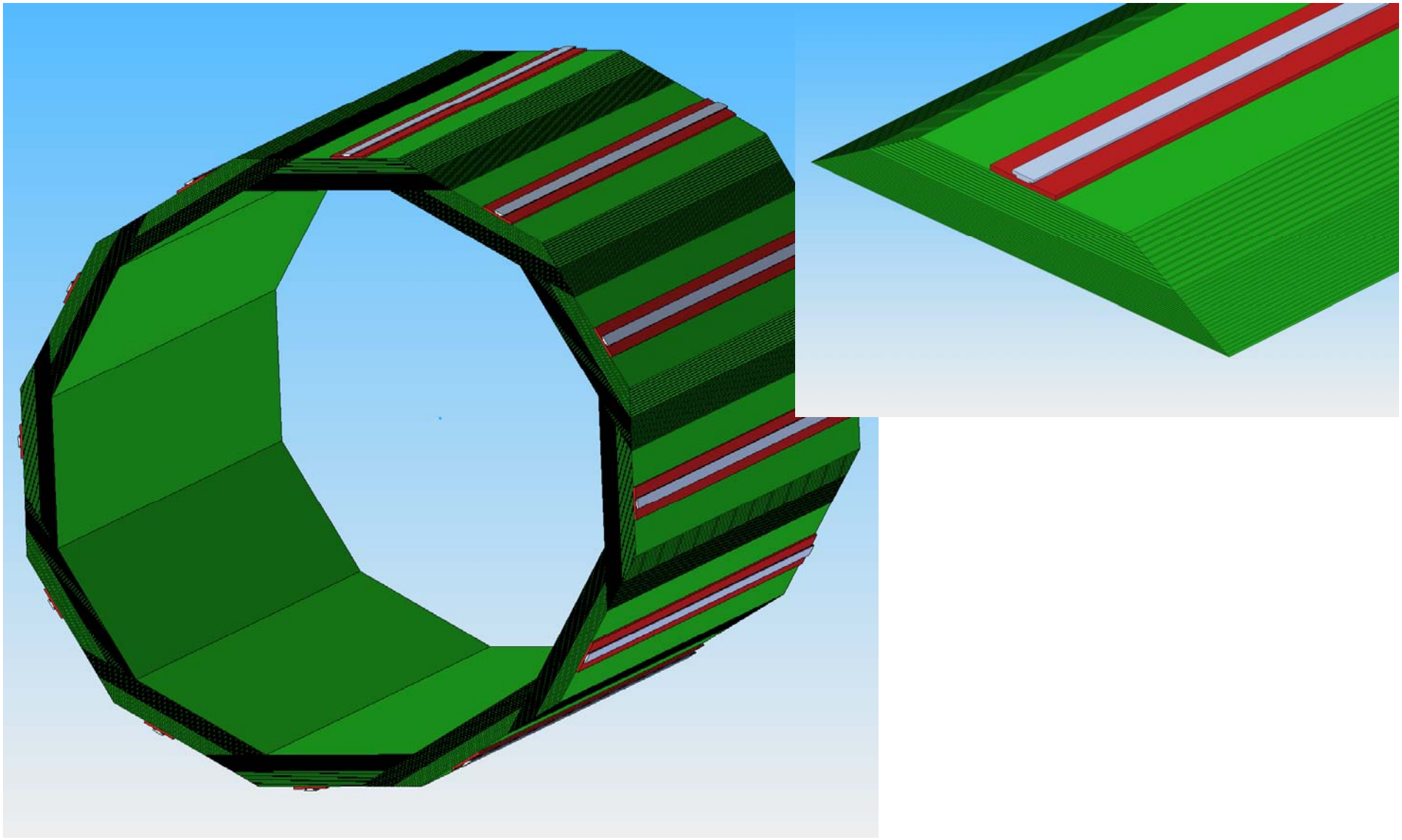
Beam Pipe/Tracker



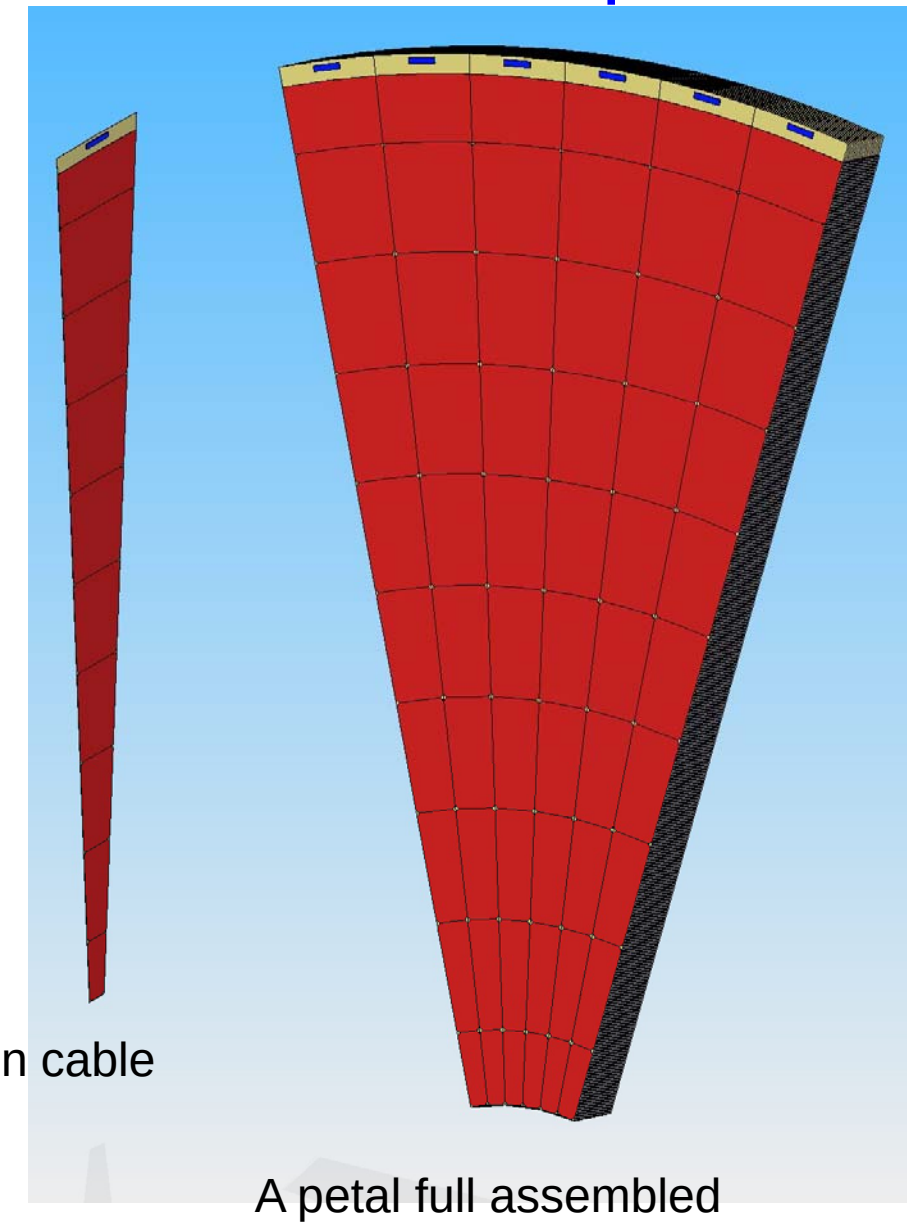
ECal Engineering Design

- **20 -2.5 mm Tungsten Plates**
- **10 - 5mm Tungsten Plates**
- **30 - 1.25mm Detector Gaps**
- **After the last 5 mm Plate there is also a detector layer***
- **12 Sided polygon***
- **No cracks**
- **Support Rails to independently support each module***

ECal Engineering Design



Ecal End Cap Module

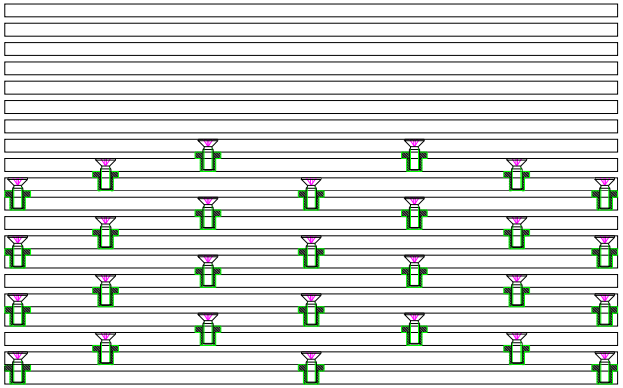


Kapton cable

A petal full assembled

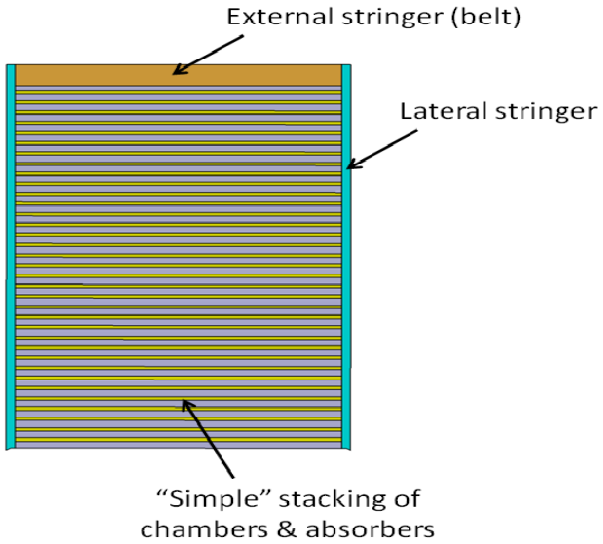
Wedges similar to barrel design

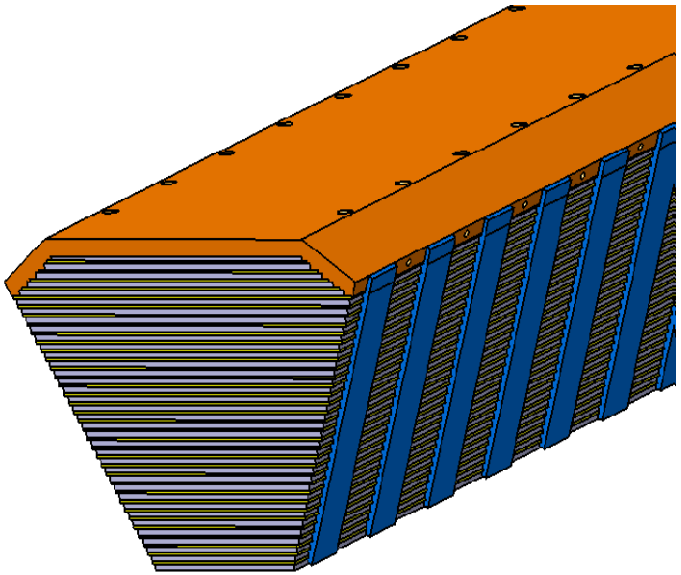
Some projectivity on the dead space, mitigated by the coiling due to B and the offset of the IP



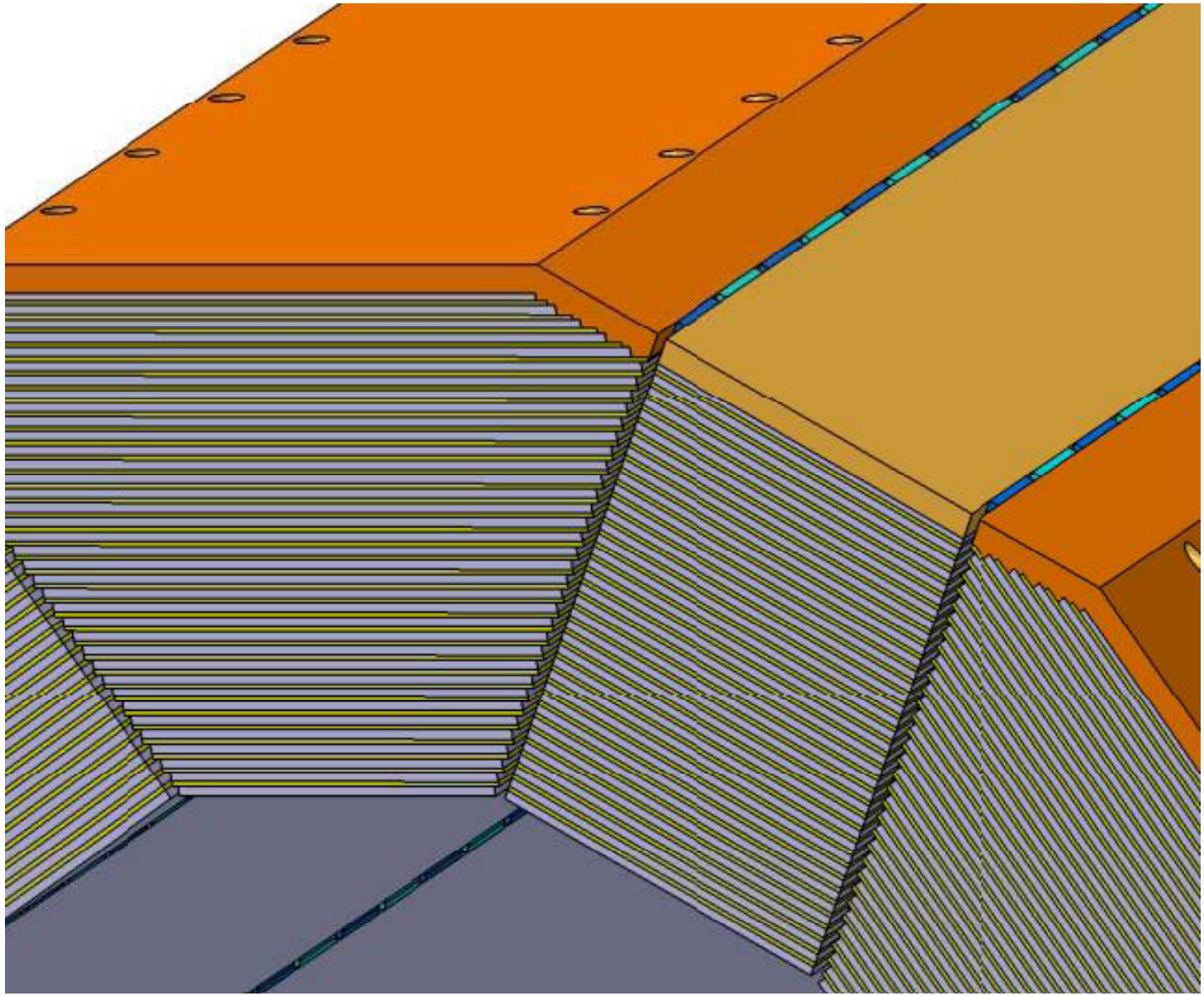
HCal Engineering Design

- **40 - 18.8mm thk. SS Plates**
- **40 - 8 mm Detector Gaps**
- **12 – Sided polygon***
- **Non-Projective Cracks***
- **Strong back Support and Support Rails***





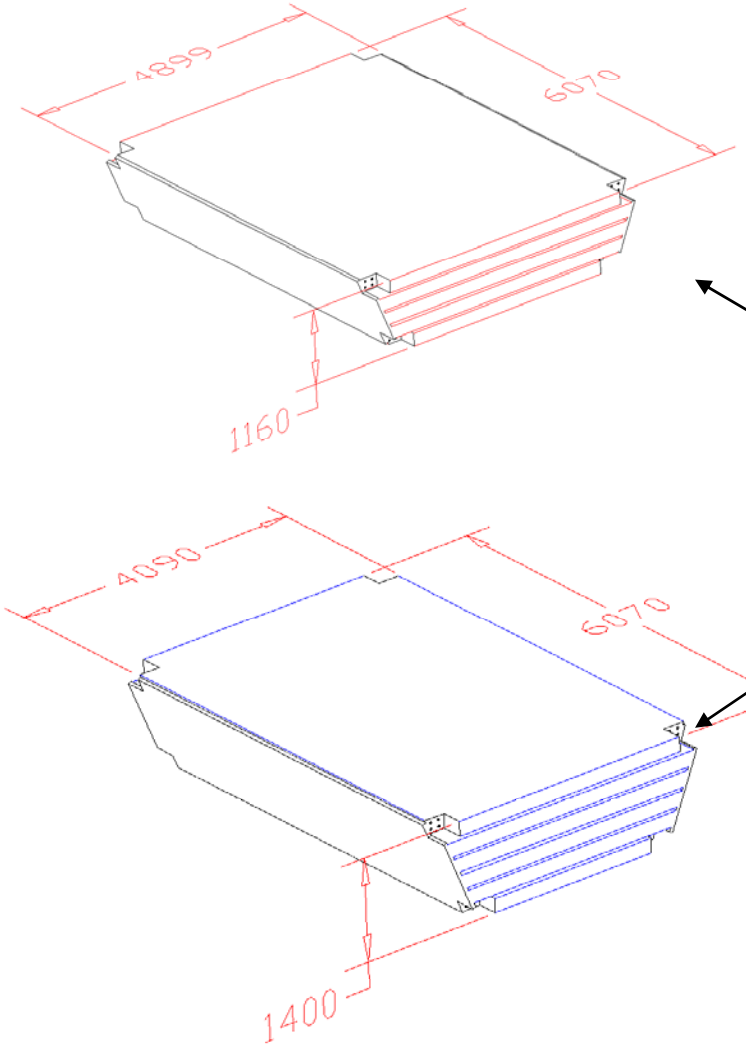
Hcal-Nonprojective Geometry



Muon Engineering Design

- **11 -200 mm Steel Plates**
- **10 - 40 mm Detector Gaps**
- **After the solenoid is a detector layer***
- **8 Sided polygon***
- **Semi-Projective Cracks***
- **Supporting Plates***

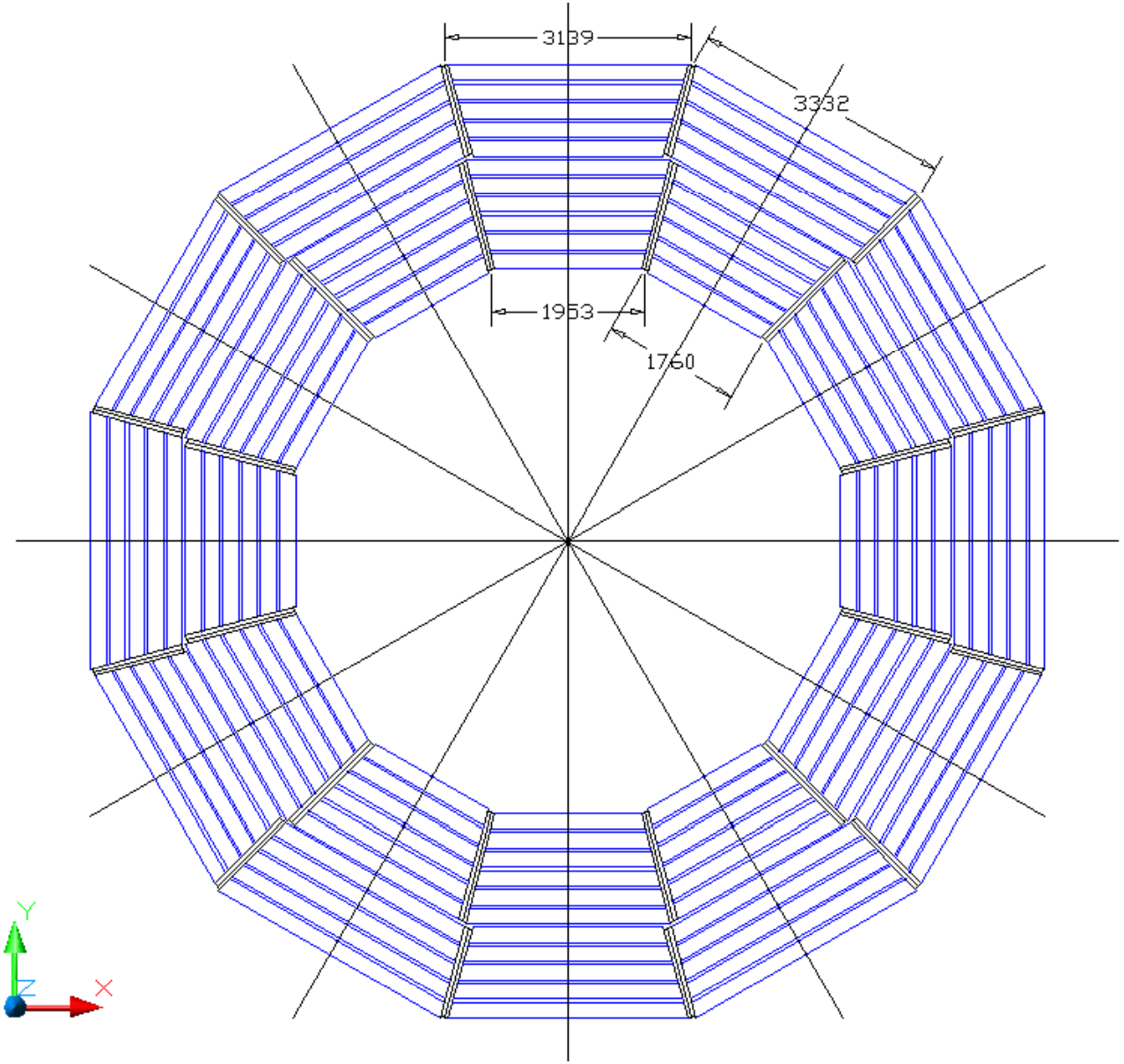
Proposal for Barrel Iron –Two Independent Rings



Outer block 211 tonne

Inner block 203 tonne

Proposed Return Barrel Iron



Cost Estimating

- **Small Subgroups and Webex meetings have been organized to review WBS Costing**
  - **Ecal Close to finalizing**
  - **Hcal Started**
  - **Tracker, Solenoid, Muon and Forward needs to start**

Cost Estimating

SiD LOI 28 Oct 08.wbs - [SLAC WBS]

File Edit WBS View Help

WBS | Materials | Labor Rates

WBS	Component	Number	Unit	Comment	Materials	MContingency	Labor	LContingency	Total
1.1.4	EM Cal	1	each	@CF=EMCal; Rtr...	73,788,912	32,180,119	18,041,690	6,314,591	130,325,312
1.1.4.1	EMCal ED&I	1	each		0	0	2,918,240	1,021,384	3,939,624
1.1.4.1.1	Conceptual Design	1	each		0	0	463,040	162,064	625,104
1.1.4.1.1.1	Mechanical Enginee	2	man year		0	0	140,000	49,000	378,000
1.1.4.1.1.2	Mechanical Designe	2	man year		0	0	91,520	32,032	247,104
1.1.4.1.2	Prototyping	1	each		0	0	463,040	162,064	625,104
1.1.4.1.3	Tendering	1	each		0	0	231,520	81,032	312,552
1.1.4.1.4	Production	1	each		0	0	231,520	81,032	312,552
1.1.4.1.5	Q&A, Testing	1	each		0	0	140,000	49,000	189,000
1.1.4.1.6	Integration	1	each		0	0	1,157,600	405,160	1,562,760
1.1.4.1.7	Installation	1	each		0	0	231,520	81,032	312,552
1.1.4.2	EMCal Common Tooling	1	each		100,000	35,000	0	0	135,000
1.1.4.2.1	EMCal Cable Assembly :	1	lot		100,000	35,000	0	0	135,000
1.1.4.3	Barrel	1	each		59,139,702	25,968,396	13,883,787	4,859,326	103,851,211
1.1.4.3.1	EMCal Mechanics	1	each		7,810,602	2,733,711	1,239,662	433,882	12,217,857
1.1.4.3.1.1	EM Calorimeter Tun	60,094	kg	Parametric	88	31	0	0	7,139,167
1.1.4.3.1.2	EMCal Tungsten Ma	933	Sq.m.		1,000	350	0	0	1,259,550
1.1.4.3.1.3	EMCal Kapton	933	Sq.m.		10	4	0	0	12,596
1.1.4.3.1.4	EM assembly tooling	4	lot		100,000	35,000	0	0	540,000
1.1.4.3.1.5	EM Installation Tool	1	lot		100,000	35,000	0	0	135,000
1.1.4.3.1.6	Wedge Mechanics	12	each		90,000	31,500	0	0	1,458,000
1.1.4.3.1.6.1	EM tooling	1	lot		60,000	21,000	0	0	81,000
1.1.4.3.1.6.2	EM Fixtures	1	each		5,000	1,750	0	0	6,750
1.1.4.3.1.6.3	EM Screws	1	each		5,000	1,750	0	0	6,750
1.1.4.3.1.6.4	EM Inserts	1	each		7,500	2,625	0	0	10,125
1.1.4.3.1.6.5	EM Rails	1	each		7,500	2,625	0	0	10,125
1.1.4.3.1.6.6	EM Cooling Pipe	1	each		5,000	1,750	0	0	6,750
1.1.4.3.1.7	Assembly	1	each		0	0	1,239,662	433,882	1,673,544
1.1.4.3.2	EMCal Sensors	1	each		51,329,100	23,234,685	12,644,125	4,425,444	91,633,354
1.1.4.4	Endcaps	1	each		14,549,210	6,176,724	1,239,662	433,882	22,399,478

Other LOI Progress

- Two Documents have been written addressing Push-pull ability with respect to technical aspects (assembly areas needed,detector transport and connections) and maintaining the detector performance for a stable and time-efficient operation.

Conclusions

- Good Engineering Progress has been made
  - Latest Designs are not incorporated in Simulation
- LOI Contributions have started or are in progress
- Engineering Designs which needs effort and might not be included in LOI.
  - Hcal End Caps
  - Muon End Walls