

CTG Engineering tools

PAC review

Charge to the CTG :

“ Specifies engineering tools, common with tools of the GDE when appropriate, for designing detectors.”

Catherine Clerc

on behalf of the CTG members

K.Krempetz, M.Oriunno,H.Yamaoka

Charge to the CTG :

“ Specifies engineering tools, common with tools of the GDE when appropriate, for designing detectors.”

Immediate needs:

➤ Common tools inside each concepts : ease the work of integration and interconnection between subdetector groups .

➤ Studies for the push-pull and experimental Hall :
Work done jointly by both detectors, BDS and Civil engineering groups .

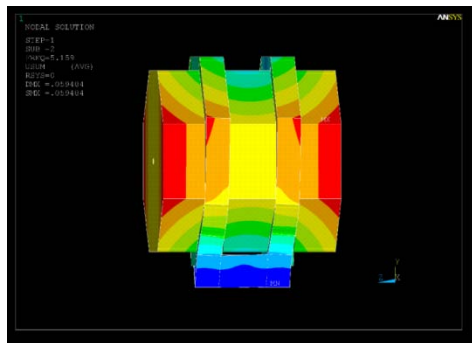
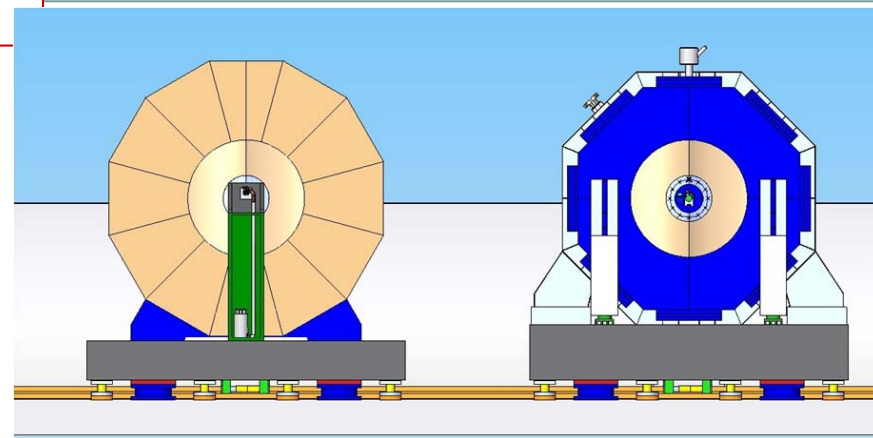
Since it is not possible to overlook the potential interferences in operation between the two detectors, it is mandatory to ensure that everyone is using the same datas and may exchange relevant engineering documents

Some detectors design tools

CAD software in use :

ILD : Autodesk inventor, Ideas, Solid edge, Solidworks, Catia

SID: Autodesk inventor, Ideas, Solid edge, Solidworks, Autocad Catia



Mechanical analysis (FEM : Finite Element Models)

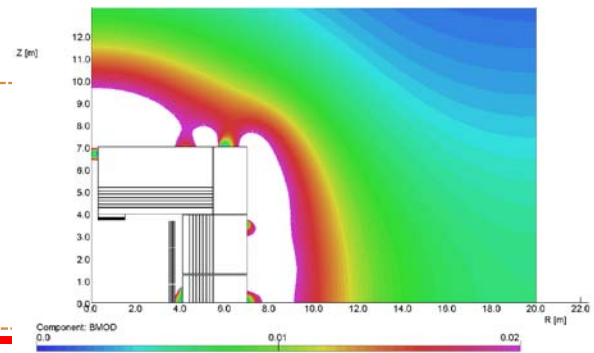
ILD : ANSYS, IDEAS, OPERA, SAMCEF, COSMOS

SID: ANSYS, IDEAS, SAP 2000, SAMCEF, COSMOS

Stray Field and magnetic Forces

ILD : OPERA, Cast 3M, ANSYS, COMSOL, CST EMStudio

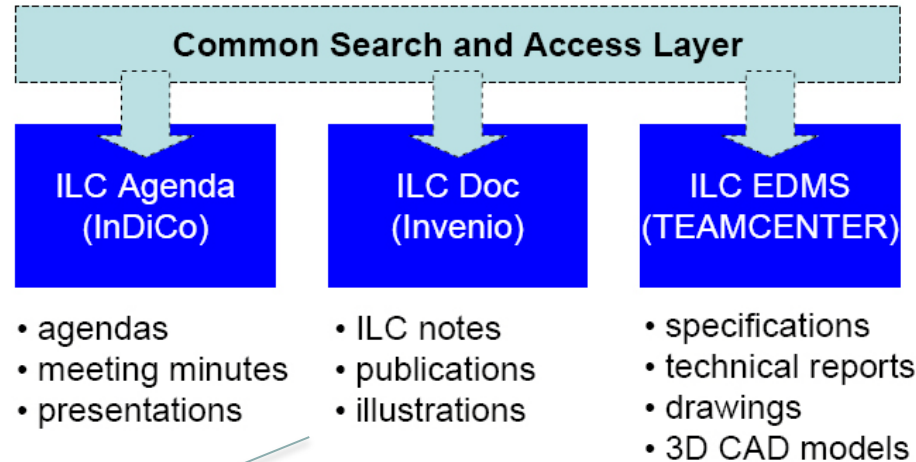
SID: ANSYS



But also electronics design, analysis tools (vibration studies)

We have to ensure of their interoperability, compatibility of inputs , i.e make the definition and enable the exchange of mandatory documents as requirements, drawing standards, technical specifications....

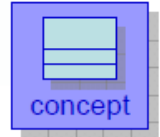
GDE Recommendations



ILC Doc : “will mostly contain documents with textual or graphic information such as technical notes, communication, schedules, presentations, publications etc “

ILC-EDMS : “Documents containing engineering data such as drawings, technical specifications and cost estimates “

Some ILC EDMS Objectives



- provide central collaboration and lifecycle mgmt. platform for the Global Design Effort of the ILC
 - enable **members of the ILC collaboration** to access and contribute project information independent of location
 - enable **engineers at the different laboratories** to collaboratively design components using 3D CAD
 - enable **scientists** to participate in design processes from the very beginning by viewing the evolving CAD models
 - provide **teams, committees, boards** etc. with workspaces for work-in-progress document management
 - support **change control** of the ILC baseline during the EDR phase
 - protect **confidential information** and intellectual property against unauthorized access

ILC-EDMS System breakdown structure:

- include a level devoted to detectors, with one level per detector,
- plus a specific workspace « interaction region « for cooperative work between detectors / BDS/CFS(push-pull studies, dimensioning of hall and services....)

The screenshot displays the ILC-EDMS system interface. On the left, a navigation tree shows the system breakdown structure, including categories like Accelerator Systems, CFS & Global, Detectors, and various detector components such as ILD, Interaction Region, and SID. The main content area shows the details for an assembly item: "Assembly , D0000001210473,A,1,1 , Item Info : Summary". The interface includes tabs for Summary, EBOM, Properties, Related Items, Next Steps, Classification, Reviewer/Approver, All Versions, and Access. The Properties tab is active, showing details such as Name, Description, Access Scheme, Designated Access Scheme, Creator, Work Status, and Purpose. A 3D CAD model of the detector assembly is visible on the right side of the interface.

Assembly , D0000001210473,A,1,1 , Item Info : Summary

Summary | EBOM | Properties | Related Items | Next Steps | Classification | Reviewer/Approver | All Versions | Access

Properties

Name:	ILD and SID with infrastructure
Description:	CAD model of the ILD and SiD detectors with scaffolding and infrastructure for Japanese mountainous site; by Marco Oriunno and Gary Bouchard; status: 27.8.2012
Access Scheme in Use:	Project: ILC_MDI
Designated Access Scheme (Project):	ILC_MDI
Creator:	Welle_Norbert
Work Status:	Released
Purpose:	for publication

[More Properties...](#)

[Find Preview Images...](#)

Team workspace definition ; ex of MDI TEAM

Main Menu
Classification
Check Out From Team
Put to WIP Vault
Make Available To Team
Submit
Route
More Actions...

Lists

- Work Lists
- My Lists
- My Teams

Create

- Part
- Documents
- Others ...

Preferences

- My Preferences
- Change Password
- Change User Data

Logs

In Service

Help

- EDMS Help
- EDMS-FAQ
- EDMS-Info
- Downloads
- DESY Imprint
- Copyright 2007

My Teams: ILC_MDI_Team: Experimental Hall

You are here: [ILC_MDI_Team](#): Experimental Hall

[Export Table As](#) CSV HTML XML

	EDMS-ID	Name	Description	Work Status	Access Scheme in Use
<input type="checkbox"/>	D0000000970815.A.1.1	CASE 8-wSND Experimental Hall	Experimental hall design for Japanese mountain site	Working	Team: ILC_MDI_Team
<input type="checkbox"/>	D0000000970895.A.1.1	CASE 8-wSND Experimental Hall STEP FILE	STEP File of the CASE 8-wSND Experimental Hall design for the Japanese mountain site	Working	Team: ILC_MDI_Team
<input type="checkbox"/>	D0000000967835.B.1.1	Engineering Specifications for the ILC Experimental Hall	Engineering Specifications for the ILC Experimental Hall; status Apr 26, 2012 (RILC12)	Released	Project: ILC_MDI
<input type="checkbox"/>	D0000000970865.A.1.1	Experimental hall design in mountain site	Experimental hall design in mountain site	Working	Team: ILC_MDI_Team
<input type="checkbox"/>	D0000000967715.A.1.1	ILC Experimental Area Layout, Single Central Shaft	Drawing of the ILC Experimental Area Layout, Single Central Shaft	Released	Project: ILC_MDI
<input type="checkbox"/>	D0000000967795.A.1.1	ILC Experimental Area Layout, Two Side Shafts	Drawing of the ILC Experimental Area Layout, Two Side Shafts	Released	Project: ILC_MDI
<input type="checkbox"/>	D0000000967755.A.1.1	ILC Experimental Area Layout, Two Side Shafts + Access	Drawing of the ILC Experimental Area Layout, Two Side Shafts + Access	Released	Project: ILC_MDI
<input type="checkbox"/>	D0000001001665.A.1.1	IR hall dose rate estimates with detector concepts	Dose rates in IR hall are estimated with several kinds of designs of detector, shielding walls and pacmans. The obtained dose rates are evaluated in comparison with	Released	Project: ILC_MDI

Related Items

Attaches

[Export Table As](#) CSV HTML XML

File Name
CASE8-wSND.jpg
CASE8-wSND_stamp.pdf
CASE8-wSND.pdf

Is In Team Folder : 1 object

Name
Experimental Hall...

Is Related From Documents : 1 object

Name
Experimental hall design in mountain site.A.1.1

Relates To Documents : 1 object

Name
CASE 8-wSND Experimental Hall STEP FILE.A.1.1

Properties

ILC Document Type: Technical Drawing

Name: CASE 8-wSND Experimental Hall

Description: Experimental hall design for Japanese mountain site

Access Scheme in Use: Team: ILC_MDI_Team

Designated Access Scheme (Project): ILC_MDI

Creator: List_Benno

Work Status: Working

Purpose:

[More Properties ...](#)

Preview Image(s)

Documentation for MDI Studies : specifications

ILC Document , D0000000967835,B,1,1 , Item Info : Summary

Summary Properties Related Items Files Next Steps Classification Reviewer/Approver

Properties

ILC Document Type: Specification
 Name: Engineering Specifications for the ILC Experimental Hall
 Description: Engineering Specifications for the ILC Experimental Hall; status Apr 26, 2012 (KILC12)
 Access Scheme in Use: Project: ILC_MDI
 Designated Access Scheme ILC_MDI

26 April, 2012

Engineering Specifications (2) : Experimentnal Hall	RDR	SID	SID in Mtn. site	ILD	ILD in Mtn. site	Comments or notes
<i>Parameters that define the underground hall volume</i>						
IR Hall Area(m) ; (W x L)	25x120		25x142		25x142	Z-shape in EU and American sites, 1-shape in Mtn. site
Beam height above IR hall floor (m)	8,6	9(7.5)	9(7.5)	9(8)	9	from top of the platform
IR Hall Crane Maximum Hook Height Needed(m)	20,5	5m above top of detector	5m above top of detector	20,5	20,5	
Largest Item to Lift in IR Hall (weight and dimensions)	400t	380(HCAL)	380(HCAL)	55t, 3x3x1.5m	400t	
IR Hall Crane	400t+2*20t	400t(200tc2)10t	(215t+30tc2)	80t(40tc2)	(250t+30tc2)	
IR Hall Crane Clearance Above Hook to the roof (m)	14.5(includes arch)		15,8	6	15,8	
Utility caverns(m) ; (W x L x H)	40x15		77.5x15x13.5		77.5x15x13.5	
Resulted total size of the collider hall (W x L x H)	25x120x39	20.2x90x30	25x142x42	29x100x30	25x142x42	
Area at garage position		19x 55.5	25x50	with side cavern	25x50	
<i>Parameters that define dimensions of the IR hall shaft and the shaft crane</i>						
Largest Item; Heaviest item to Lower Through IR Shaft (weight and dimensions)	9x16m, 2000t	3287t (Barrel Iron)	-	3500t, 15.7x7.81m	-	
IR Shaft Size : diameter(m)	16	18, 8	-	18, 10	-	
IR shaft fixed surface gantry crane. If rented, duration	1.5 years	1.5 years	-	1.5 years	-	
Surface hall crane should serve IR shaft	Yes	Yes	-	Yes	-	
Other shafts near IR hall for access	No	Yes	-	No	-	
Elevator and stairs in collider hall shaft	Yes	?	-	Yes	-	
Size of access tunnel at Mtn. site (W x H, m)	-	-	11x9	-	11x11	cable racks in the access tunnel, e.g. Air duct,
Inclination of access tunnel at Mtn. site (%)	-	-	-	-	<7	
Length of access tunnel at Mtn. site (km)	-	-	1,5	-	1,5	
<i>Parameters that define dimensions of the surface assembly building and its crane</i>						
Surface Assembly Building Area (W x L , m)	25 x 100 / detector	200x200		30x60	27x100 / detector	
Largest Item to Lift in SurfAsm. Bldg. (weight and dimensions)	400t	380(HCAL)	(125+α)z, 6.78 z ± 0.066	180t	400t, 8.6px8 (solenoid)	
Surface Assembly Crane	400t+2*20t	400t(200tc2)10t	400t(200tc2)10t	2x80t	(200t+20tc2)	same as in the hall
SurfAsm. Crane Maximum Hook Height Needed(m)	18	20	20	19	20,5	
SurfAsm. Crane Clearance Above Hook to the roof (m)	?			5m to ceiling	6,5	
Resulted volume of surface assembly building (W x L x H, m)	25 x 100 x 25			30x60x24	27x200x27	area is the main parameter
<i>Parameters that define crane access area and clearance around detector</i>						
SurfAsm. crane accessible area (needed) / available (W x L, m)	20 x 102	200 x 200	200 x 200	28x56		SID's very preliminary
IR hall crane accessible area (needed) / available (W x L, m)	22 x 98		18x98	28x41	18x98	
Maximum Detector Height(m)		16.15	16.15	15.74	15.74	
Detector Width (m)		18.53(14.334)	18.53(14.334)	15.665	15.665	
Minimum Detector Clearance (W x L x H, m)		12.4x11.2x12.4	12.4x11.2x12.4	15.67x13.26x15.74	15.67x13.26x15.74	from Lol
<i>FILL IN OTHER IMPORTANT PARAMETERS WHICH ARE MISSING</i>						
Maximum AC power (MW)	-					540KW/exp
Temperature control (°C)	-					
Humidity control (%)	-					
Sump Pump Control System (ground water)	-					
Cryogenics system : 4K He liquefier and large dewar	-	same level as the coil on the detector	same level as the coil on the detector	service cavern	service cavern	the liquefier will be mounted at the same level as the top of the solenoid.
Dump register	-			service cavern	service cavern	damp resistor can be also at the side wall

Is In Team Folder : 1 object

Name

Experimental Hall...

Is Description for : 2 objects

Name

The Two detectors : System breakdown description

international linear collider

ILC Document , D0000000983825,A,1,1 , Item Info : Summary

Submit | Bookmark | History | History Current Lifecycle | Make Available To Team | More Actions...

Summary | Properties | Related Items | Files | Next Steps | Classification | Reviewer/Approver | All Versions | Access

Properties

ILC Document Report

Type: Review of Interaction Region Cavern Layout Design

Name: Design of the interaction cavern for the European region; Rev. B, March 2010
filename: "Report_Review of IR Cavern Design_Master_v02.docx"

Description: Design of the interaction cavern for the European region; Rev. B, March 2010
filename: "Report_Review of IR Cavern Design_Master_v02.docx"

Access Scheme in Use: Project ILC_CFS

Designated Access Scheme (Project): ILC_CFS

Creator: List_Benno

Work Status: Released

Purpose: for preliminary publication

[More Properties...](#)

Related Items

Attachments

Export Table As CSV HTML XML

File Name
Report_Review_of_IR_Cavern_Layout.docx
Report_Review_of_IR_Cavern_Layout.pdf
Report_Review_of_IR_Cavern_Layout.jpg
Report_Review_of_IR_Cavern_Layout_slampdf

Is Description for : 1 object

Name
Interaction Region.A.1.1

ILC Document

- CFS & Global
- Detectors
- LD
- Interaction Region
- SD
- TPC Large Prototype
- Management & Organisation
- SCRF Linac Technology
- System-Wide Integration
- ILC TDP

WBS Element , D000000053147,A,1,1 , Item Info : Summary

Check Out | Submit | Item Reports | Bookmark | History | More Actions...

Summary | WBS | Properties | Related Items | Files | Next Steps | Classification | Reviewer/Approver | All Versions | Access

Properties

WBS The Silicon Detector at the ILC

Name: The Silicon Detector at the ILC

Description: The Silicon Detector at the ILC

Sub Type: Assembly

Access Scheme in Use: Project SIG_WBS

Designated Access Scheme (Project): SIG_WBS

Creator: List_Benno

Work Status: Working in Vault

Purpose: Working in Vault

[More Properties...](#)

Related Items

Attachments

Export Table As CSV HTML XML

File Name: sig.as

Uses WBS Elements : 10 objects

Name
Beamsystem.A.1.1
EHC.A.1.1
Electronics.A.1.1
EHC.A.1.1
Estimator.A.1.1
...more Items

Has Description : 1 object

Name
SD.Letter of Intent.A.1.1

3D Model

3D Model.A.1.9

3D Placeholder Model.A.1.3

3D detector simulation model.A.1.1

ILC Document

- Machine Detector Interface
- Outer Tracking
- Physics & Optimization
- Project Management
- Solenoid
- System Tests & R&D
- Vista
- Interaction Region
- SD
- Beamsystem
- Electronics
- Dir Cal
- HCAL
- Installation
- Magnet
- Management
- Muon Tracker
- Tracker
- Vertex Detector
- TPC Large Prototype
- Management & Organisation
- SCRF Linac Technology
- System-Wide Integration
- ILC TDP

1. Definition and implementation of the adequate product breakdown structure for both detectors.
2. Creation of simplified 3D model (placeholders) extracted from detailed 3D CAD models .

TDD, TDR and ILC-EDMS



Technical Design Report (TDR) summarizes TDD for publication

Technical Design Documentation (TDD) captures entire design efforts, results & rationale

Parameter	Value	Unit	Comment
Electron drive beam (primary electron beam)			
Electron beam energy [GeV]	5.0	GeV	
Electron beam current [mA]	100	mA	
Electron beam position [mm]	0.0	mm	
Electron beam size [mm]	0.5	mm	
Electron beam divergence [mrad]	0.5	mrad	
Electron beam length [mm]	100	mm	
Electron beam spot size [mm]	0.5	mm	
Electron beam energy spread [eV]	100	eV	
Electron beam current spread [mA]	10	mA	
Electron beam position spread [mm]	0.5	mm	
Electron beam size spread [mm]	0.5	mm	
Electron beam divergence spread [mrad]	0.5	mrad	
Electron beam length spread [mm]	100	mm	
Electron beam spot size spread [mm]	0.5	mm	
Electron beam energy spread [eV]	100	eV	
Electron beam current spread [mA]	10	mA	
Electron beam position spread [mm]	0.5	mm	
Electron beam size spread [mm]	0.5	mm	
Electron beam divergence spread [mrad]	0.5	mrad	
Electron beam length spread [mm]	100	mm	
Electron beam spot size spread [mm]	0.5	mm	

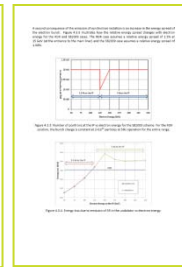
Parameters

Specification	Value	Unit	Comment
Electron beam energy [GeV]	5.0	GeV	
Electron beam current [mA]	100	mA	
Electron beam position [mm]	0.0	mm	
Electron beam size [mm]	0.5	mm	
Electron beam divergence [mrad]	0.5	mrad	
Electron beam length [mm]	100	mm	
Electron beam spot size [mm]	0.5	mm	
Electron beam energy spread [eV]	100	eV	
Electron beam current spread [mA]	10	mA	
Electron beam position spread [mm]	0.5	mm	
Electron beam size spread [mm]	0.5	mm	
Electron beam divergence spread [mrad]	0.5	mrad	
Electron beam length spread [mm]	100	mm	
Electron beam spot size spread [mm]	0.5	mm	
Electron beam energy spread [eV]	100	eV	
Electron beam current spread [mA]	10	mA	
Electron beam position spread [mm]	0.5	mm	
Electron beam size spread [mm]	0.5	mm	
Electron beam divergence spread [mrad]	0.5	mrad	
Electron beam length spread [mm]	100	mm	
Electron beam spot size spread [mm]	0.5	mm	

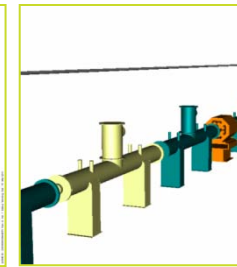
Specifications

Item	Quantity	Unit Price	Total Price	Comment
Electron beam energy [GeV]	5.0	100	500	
Electron beam current [mA]	100	10	1000	
Electron beam position [mm]	0.0	10	0	
Electron beam size [mm]	0.5	10	5	
Electron beam divergence [mrad]	0.5	10	5	
Electron beam length [mm]	100	10	1000	
Electron beam spot size [mm]	0.5	10	5	
Electron beam energy spread [eV]	100	10	1000	
Electron beam current spread [mA]	10	10	100	
Electron beam position spread [mm]	0.5	10	5	
Electron beam size spread [mm]	0.5	10	5	
Electron beam divergence spread [mrad]	0.5	10	5	
Electron beam length spread [mm]	100	10	1000	
Electron beam spot size spread [mm]	0.5	10	5	
Electron beam energy spread [eV]	100	10	1000	
Electron beam current spread [mA]	10	10	100	
Electron beam position spread [mm]	0.5	10	5	
Electron beam size spread [mm]	0.5	10	5	
Electron beam divergence spread [mrad]	0.5	10	5	
Electron beam length spread [mm]	100	10	1000	
Electron beam spot size spread [mm]	0.5	10	5	

Cost Estimation



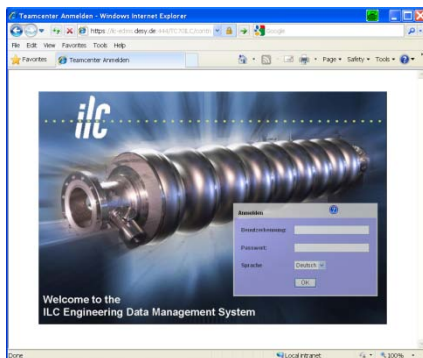
Calculations



CAD Models



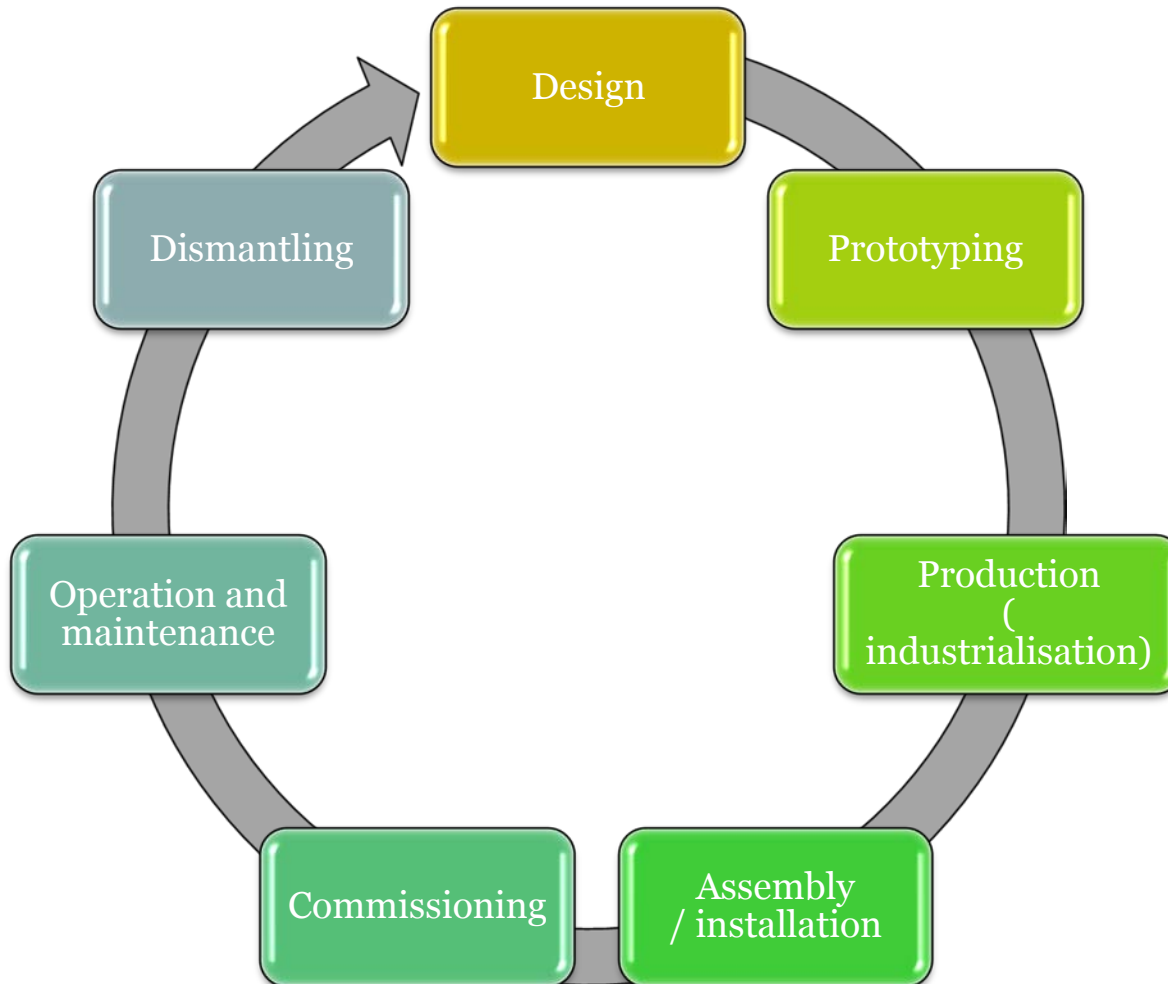
Design Summary



ILC-EDMS organizes the Technical Design Documentation, providing **structure, traceability, version & configuration mgt., and change control**

(From L.Hagge)

Product lifecycle management : ILC is a 25-30 years experiment



Summary:

Ready to operate for detectors :

- System breakdown structures describing the main components of the 2 detectors has been created
- ILC_MDI_Team : already use the system and upload relevant documents for Hall design studies

It is already organised to efficiently follow the two detectors projects among each step of their life

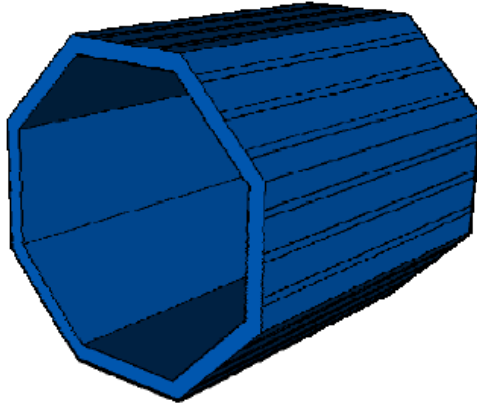
It is to become an important and major tool for the future of the ILC detectors as a collaborative and management tool .

But If the use of this EDMS provides the selection, definition and tracking of the mandatory documentation, the management of this documentation is a major issue and is to be established

SPARE

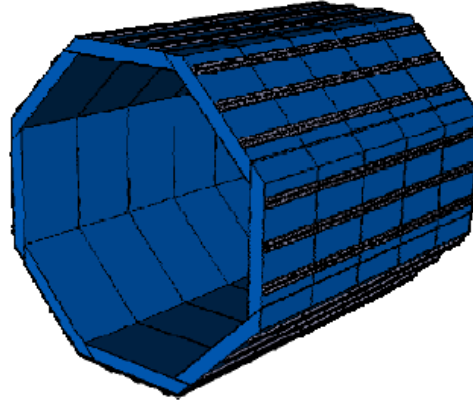
Different Models for Different Purposes

Placeholder



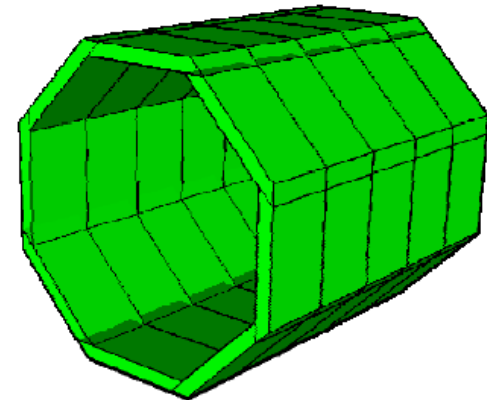
Placeholder model enables integration and checks for collisions and compliance of interfacing components; Contains e.g. reserved space and interface details.

Detailed Design



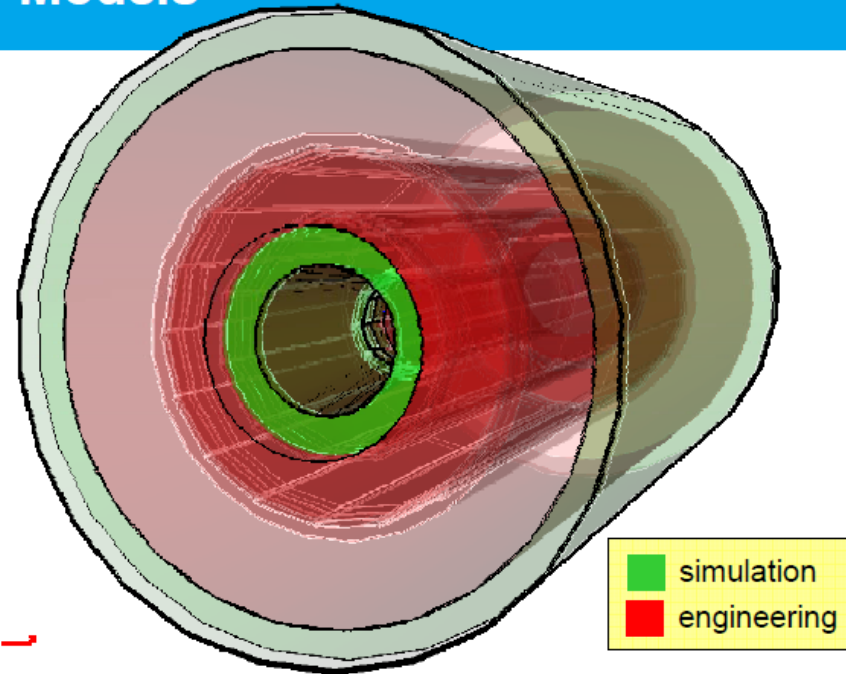
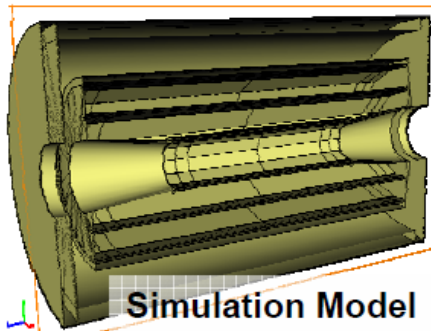
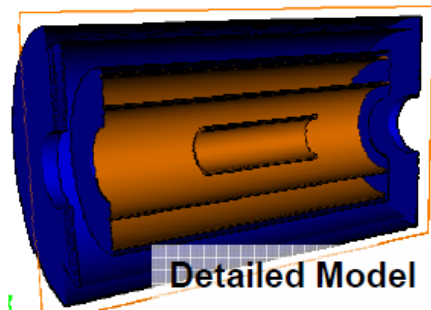
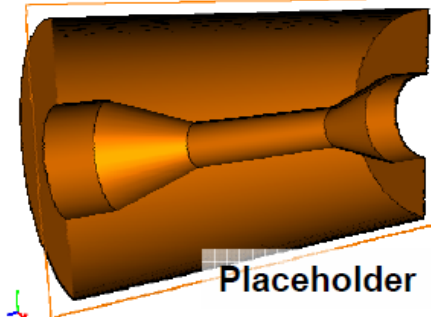
Detailed Design model is basis for construction; Defines how to assemble a component from parts, and provides their exact geometry and material properties

Physics Simulation



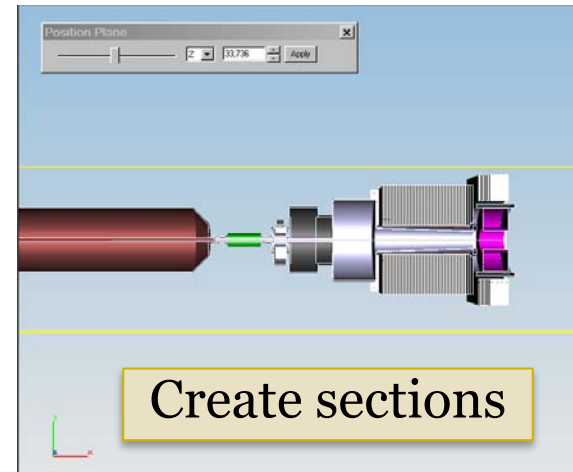
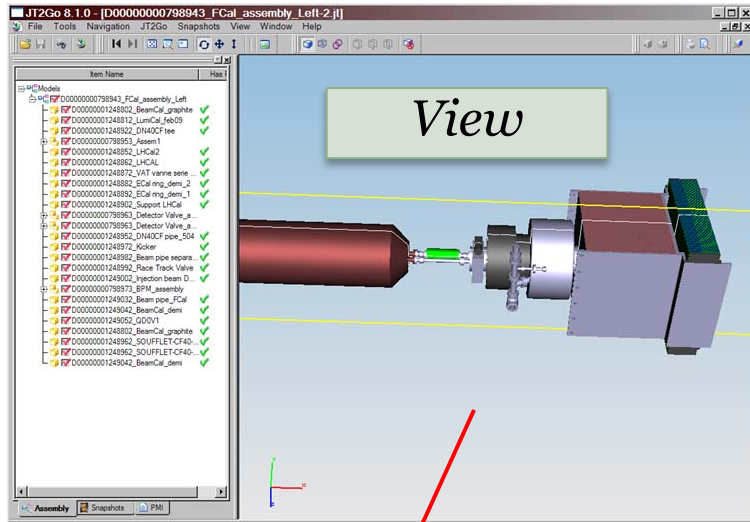
Physics Simulation model enables MC simulation and detector optimization; Describes e.g. segmentation, shape and physics behavior of components

Comparing Different VXD Models



- > Engineering and simulation models contain different elements, e.g. housing vs. pads
- > Need to identify comparable geometry, and perform collision checks to ensure e.g. active material is confined inside chamber

Viewer uses : Dimensional compatibility of the design subdetectors .



snapshot
And pictures

