

A 3D cutaway diagram of an ILC particle accelerator. The diagram shows a long, yellow cylindrical structure (the main pipe) supported by blue metal frames. A person in a blue uniform and yellow hard hat is standing on a walkway next to the structure, providing a sense of scale. The structure is surrounded by various pipes, valves, and support systems. The background is white with a horizontal line of small yellow dots.

WP 5 ILC Siting in Europe Work Package Report

ILC-HiGrade Scientific and Annual Mtng.

CERN

25 February 2010

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Response to AAP Review at TILC'09

Technical designs of configurations such as RF power distribution and the treatment of operational reliability (downtime for klystron replacement etc.), safety and radiation aspects should be handled in a consistent and transparent manner. Each configuration should be subject to an in-depth risk analysis that includes consideration of the operation and maintenance aspects

- *The CFS Group Reviewed both the Klystron Cluster and DRFS RF Power Distribution Alternatives as Part of the SB 2009 Process*
- *The Asian Region Site Conditions Favored the DRFS Alternative*
- *The European Region Site Conditions Favored the Klystron Cluster Alternative*
- *The Americas Region Site Conditions Allow the Use of Either RF Distribution System*
- *The CFS Group has Incorporated Safety and Radiation Considerations into All of the Regional CFS RF Studies*



Response to AAP Review at TILC'09 Installation and Maintenance Aspects

- *The Current 2D CFS Machine and Enclosure Drawing Does Reflect and Initial Consideration for Aisle Spacing and Continuity to Accommodate Installation and Maintenance of Beamline Components*
- *It is Not Comprehensive in Nature*
- *No Work on Installation Issues has been Completed by the CFS Group Since Before 2008*
- *A Separate Study for Both Installation and Maintenance Issues Needs to be Conducted to Identify Problem Areas and Develop Further Criteria for Tunnel and Enclosure Adjustments to Accommodate Installation and Operational Considerations*
- *CFS Can Help in this Effort, But Resources will be Required and Technical Systems Must Take the Lead in this Effort*
- **CERN have resources available to help this effort**



Response to AAP Review at TILC'09

The AAP encourages further exchange between the various area groups. In many cases, guidance from the project managers is necessary for systematic application across the project. For these CFS efforts to be most useful, it is important to define clearly the main assumptions and technical choices

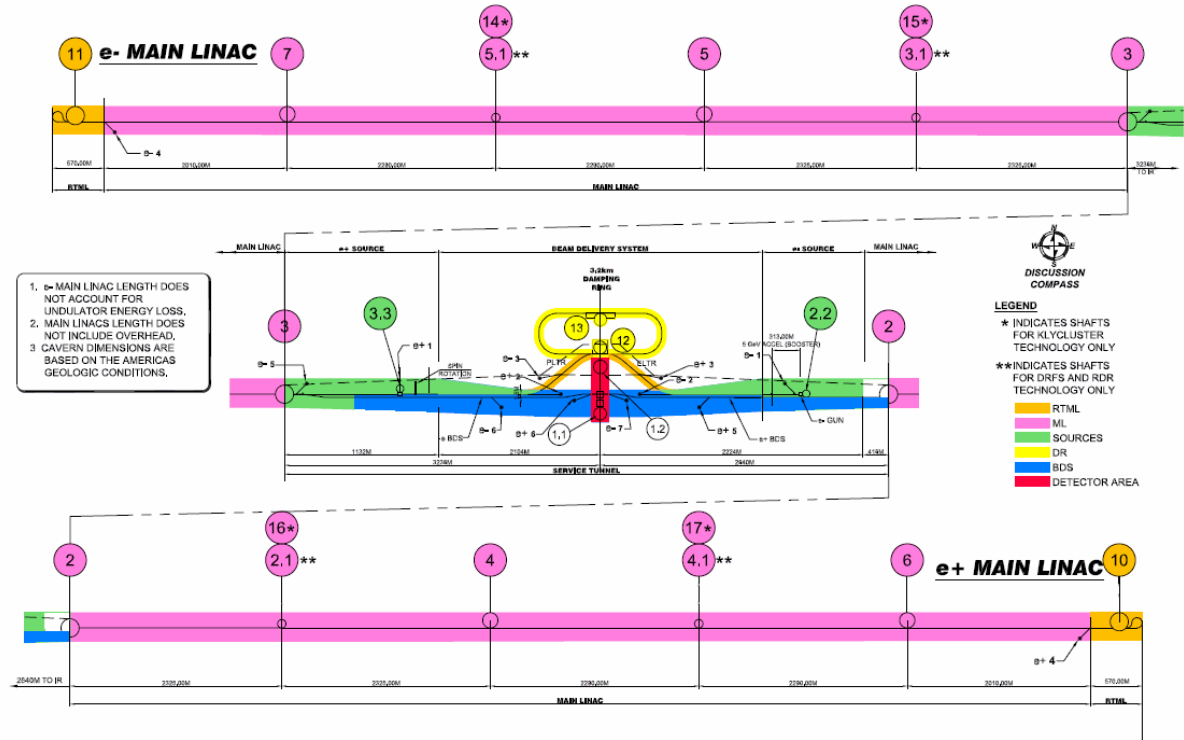
- ***Since the Previous AD&I Meeting in May, 2009 the CFS Group has had Several Direct Meetings with the Various Area System Groups***
 - ***CFS Weekly Video/Webex Meetings were Devoted to Specific Area Systems with AS Representatives***
 - ***A CFS 2-Day Workshop was Held at SLAC in July, 2009***
 - ***A Second CFS 2-Day Workshop was Held at the Daresbury Laboratory in September, 2009***
 - ***Both CFS Workshops Allotted Time for Each Area System with Direct and/or Webex Participation with AS Representatives***
- ***From These Meetings Criteria were Developed for the Layout of Each Area System and Combined into a Single Complete Machine Layout Which did Undergo Several Iterations***



Response to AAP Review at TILC'09

- *Norbert Collomb was the Main CFS Point of Contact to Collect and Combine all of the Area System Technical Criteria into a Complete Beam Layout*
- *After Several iterations a Complete Technical Beamline Layout was Established in Mid-October, 2009*
- *This Layout was Used by the CFS Group at FNAL to Develop the Final 2D Layout for the Tunnels and Enclosures to Match the Technical Beamline Layout*
- *These Drawings Were Posted on the EDMS System in Mid-November, 2009*
- *These 2D Drawings are the Basis for the On-Going 3D Drawing Effort*
- ***New Lattice received from Norbert Collomb 15 Feb 2010, CERN currently using it to develop new 3d model***

CFS Overall Machine Layout Drawing



1. ← MAIN LINAC LENGTH DOES NOT ACCOUNT FOR UNDULATOR ENERGY LOSS.
2. MAIN LINACS LENGTH DOES NOT INCLUDE OVERHEAD.
3. CAVERN DIMENSIONS ARE BASED ON THE AMERICAS GEOLOGIC CONDITIONS.

SITE / TUNNEL LENGTHS (M)				
← SBC	e+ SBC	NV.S/SOURCES	DAMPING RING	TOTAL
ML + RTML	ML + RTML	SERVICE/EL/TW/PLTR	3000	33945
11810	31830	818		

TUNNELS WIDTH (M)					
AREA SYSTEM	← EJECTOR	DJR	R.T.M.L.	MAIN LINAC	e+ EJECTOR
AMERICAS/RTML	4.6 x 4.6 x 4.6 METRIC AREAS	5.0	4.5	4.5	4.5 x 4.5 x 4.5 METRIC AREAS
EJECTOR/DR				5.0	
BDS/DR					

SHAFT BASE CAVERNS					
POINT	1	2	3	4	5
(L x W x H) (m)	5.5 x 10 x 5.5	5.5 x 10 x 7	10x10x7	10	14.16 x 16.17

SHAFTS													
POINT	1	2	3	4	5	6	7	8	9	10	11	12	13
(L x W x H) (m)	2.0 x 2.0	1.5 x 1.5	1.5 x 2.2	3	3.2	4	2	3	3	3	3	3	3

DETECTIONS HALL		MUD/WALL WORKINGS	
POINT	1	2	3
(L x W x H) (m)	10 x 13 x 7	20 x 3 x 15	20 x 4 x 8

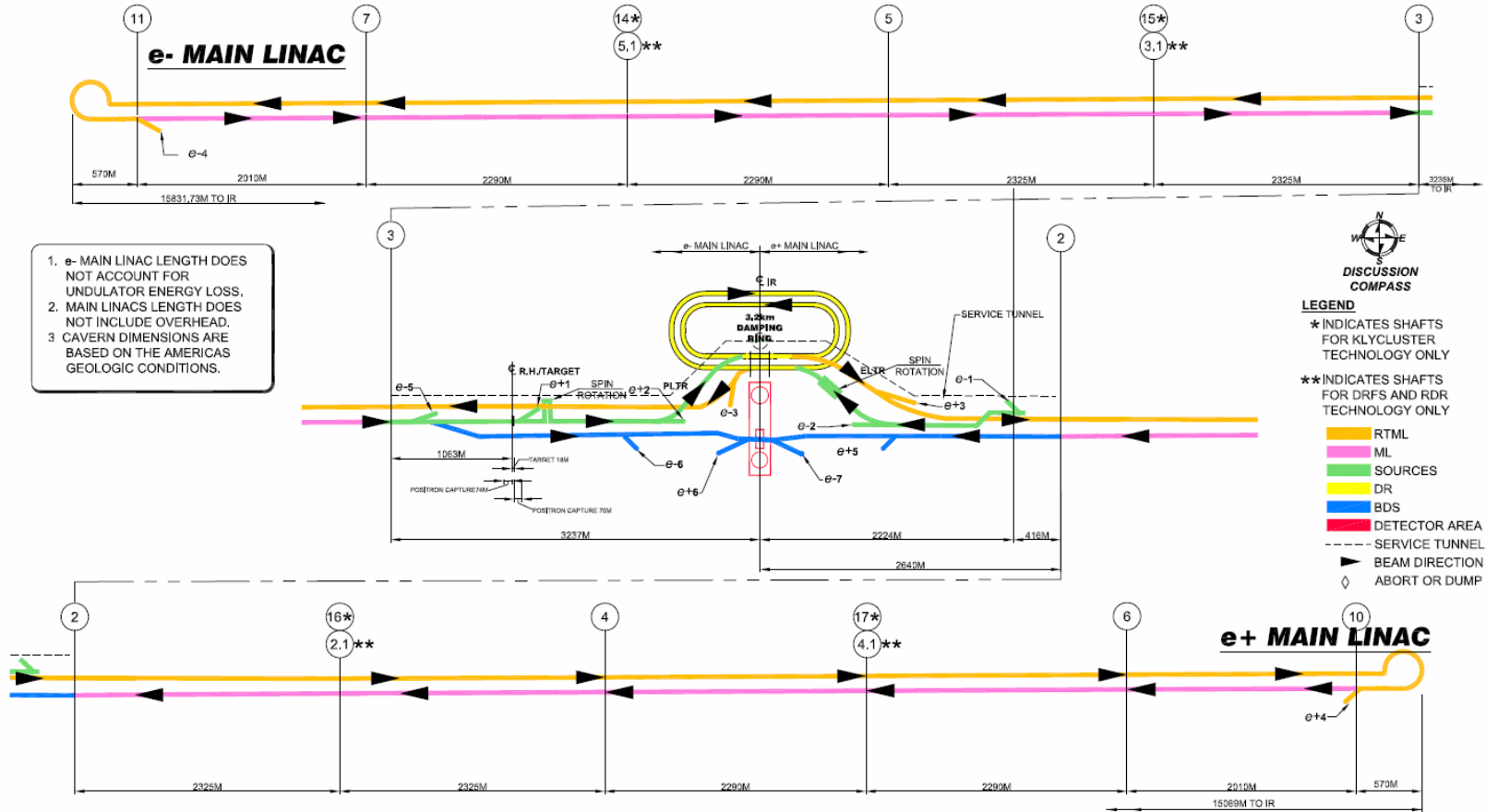
- Ø= 1 NC TUNE UP DUMP 110KW
- Ø= 2 SC TUNE UP DUMP 311KW
- Ø= 3 EDXRX TUNE UP DUMP 311 KW
- Ø= 4 RTML TUN EUP DUMP 223 KW
- Ø= 5 e-MAINAC FAST ABORT 11 KW
- Ø= 6 BDS TUNE UP DUMP 16MW
- Ø= 7 PRIMARY → DUMP → 20MW
- Ø= 1 TARGET DUMP 223 KW
- Ø= 2 SC TONE UP DUMP 311 KW
- Ø= 3 PDRX TUNE UP DUMP 311 KW
- Ø= 4 RTML TUNE UP DUMP 223 KW
- Ø= 5 BDS TUNE UP DUMP 16MW
- Ø= 6 PRIMARY e+ DUMP → 20 MW

BEAM ABORT CAVERNS (M)			
POINT	SOURCES	RTML	ML
(L x W x H) (m)	WITHIN TUNNEL	10 x 13 x 7	20 x 3 x 15

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Draft
11-20-09



Global Design Effort - CFS



Beamline "Arrow Diagram"

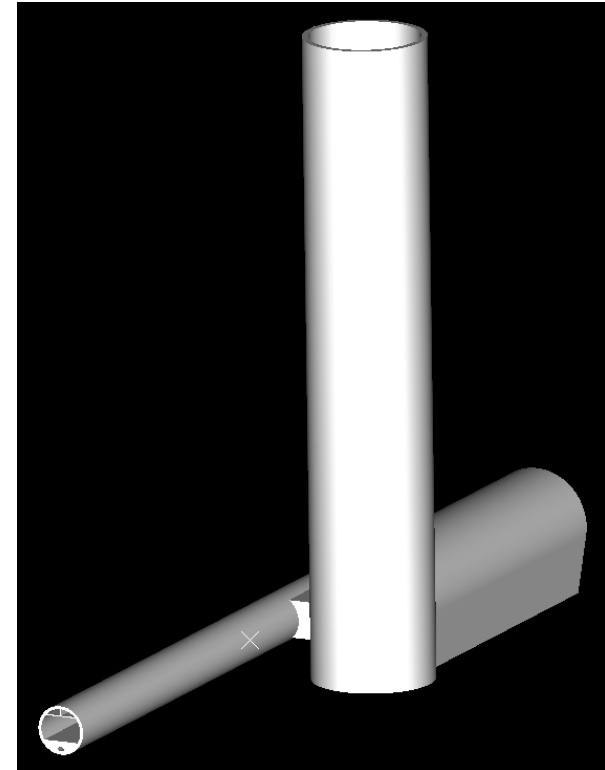
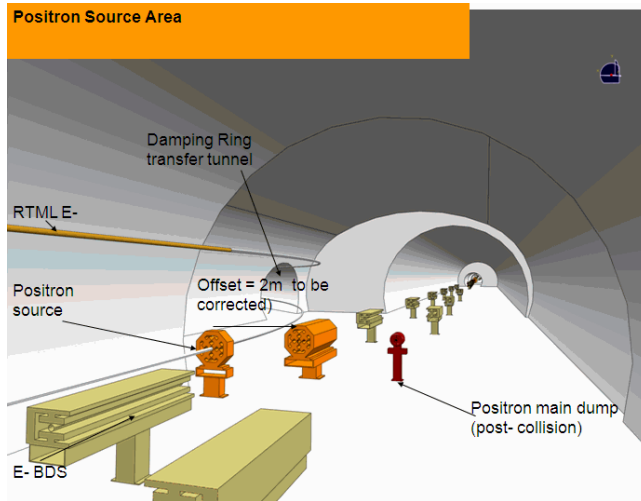
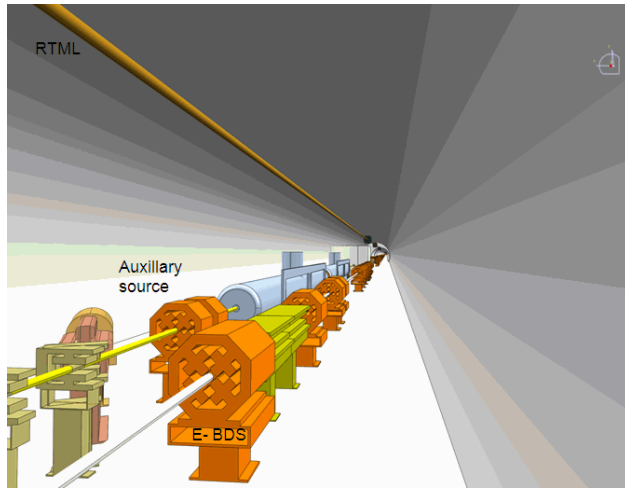
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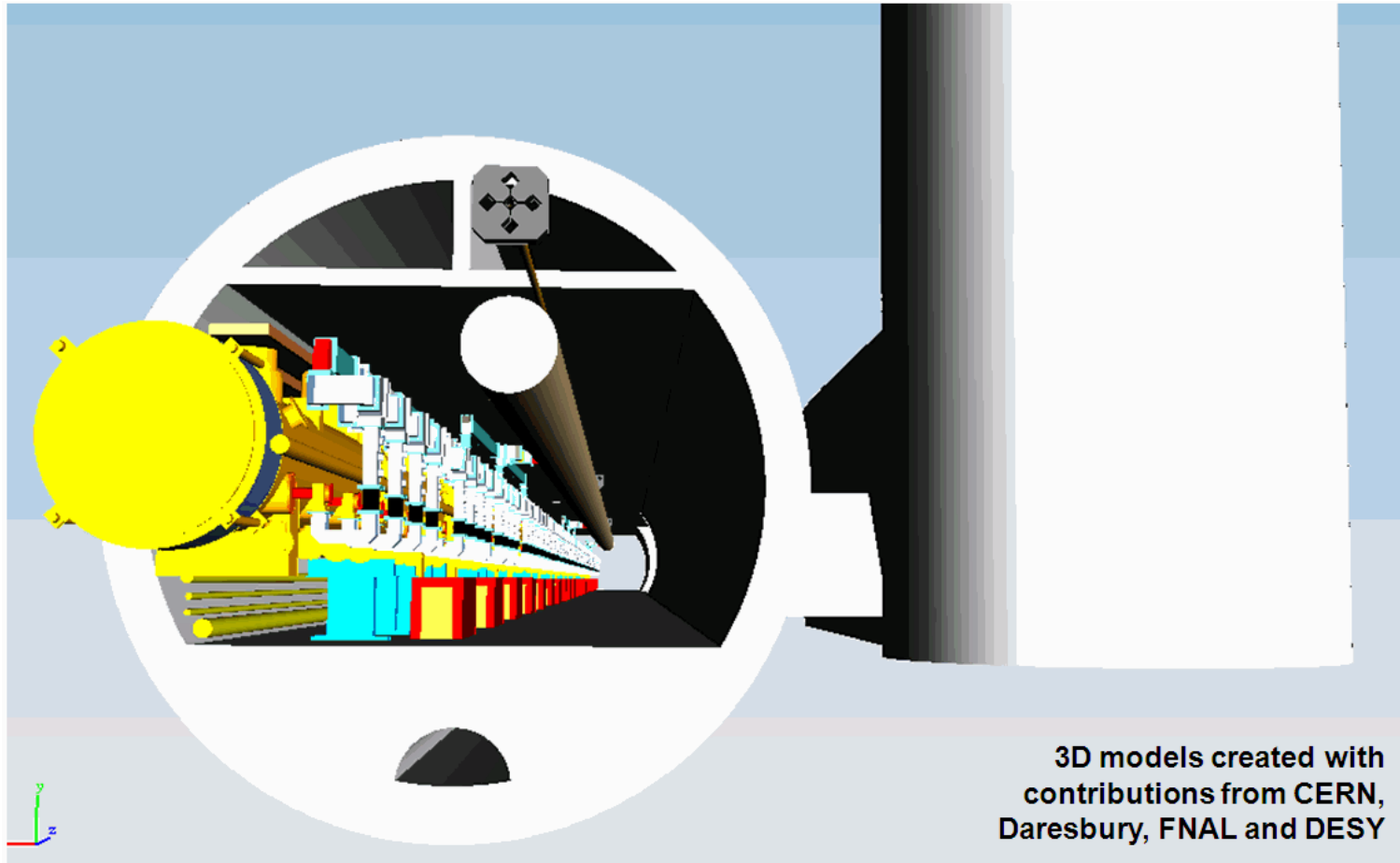
Response to AAP Review at TILC'09

The AAP is impressed by the progress of the 3d tool integration. The tools are recognized as an important aid in understanding critical aspects of a chosen layout, where the benefits from the resource-intensive implementation efforts may be justified.

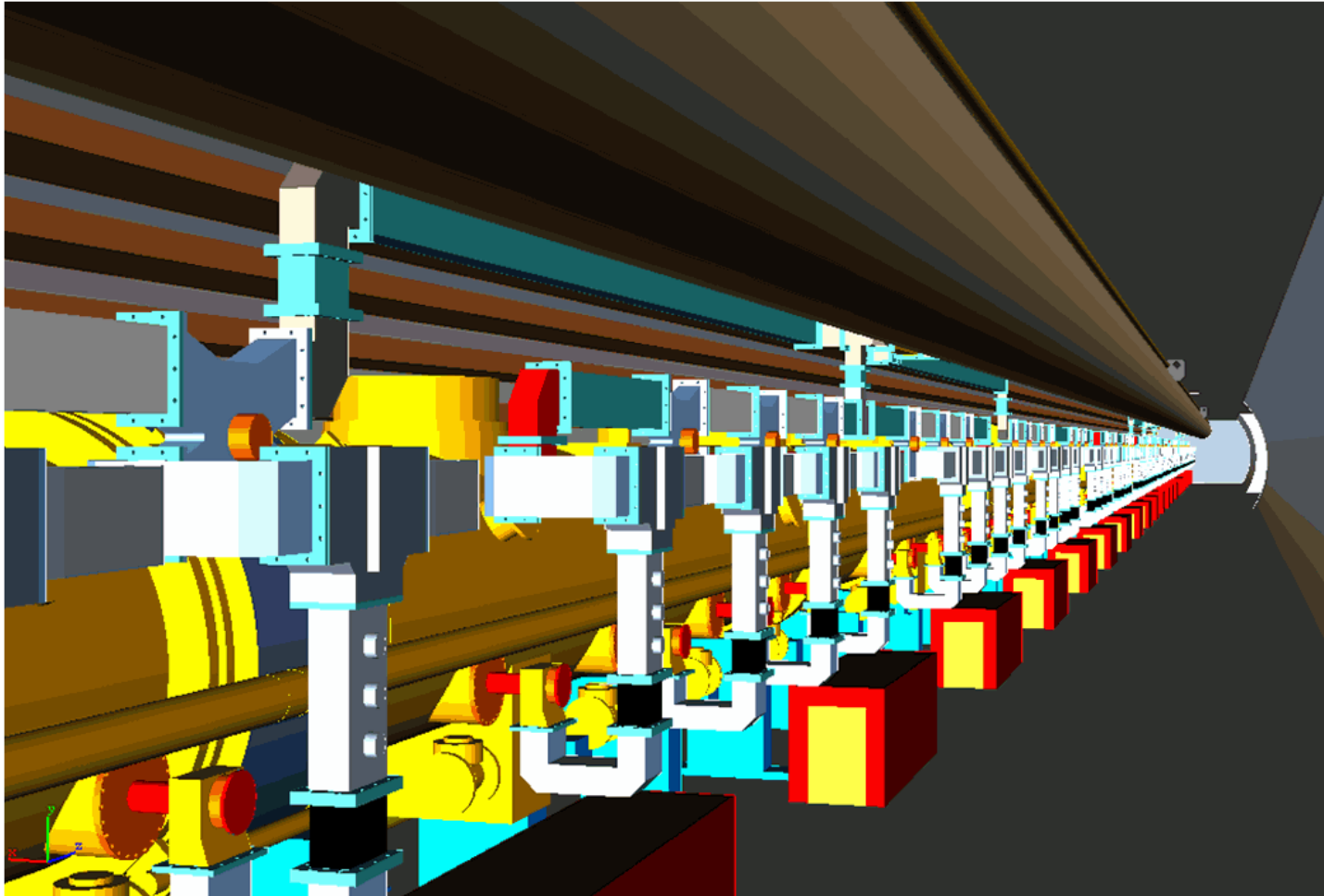
- *The 2D Machine Layout Drawing is the Basis for the 3D CFS Enclosure Drawing that is Being Developed by the CFS Effort at CERN Using the European Cavern Configuration (More to Come on This Issue)*
- *The 2D Machine Layout Drawing is also the Basis for the 3D Support Utility Drawings that are Being Developed by the CFS Effort at FNAL (M+W Zander)*
- *3D Drawings are Being Forwarded to DESY for Inclusion into the Complete ILC 3D Model as They Progress*
- *Currently the Focus of the 3D Effort are Two 100m Sections of the Machine Layout as a Starting Point*



European CFS Group 3D Drawing Examples



DESY 3D Drawing Example



DESY 3D Drawing Example



Regional Impact on the 3D Drawing Effort

- **The Asian Region has Focused on the Distributed RF System While the Americas and European Regions have Focused on the Klystron Cluster RF System**
- **The Asian and European Regions Use 5.2 m Main Linac Tunnel Diameter and the Americas Region Uses a 4.5 m Main Linac Tunnel Diameter**
- **The European CFS Group is Developing a 3D Enclosure Model Based on the 5.2 m Tunnel**
- **The Americas Region is Developing a 3D Mechanical Support Model Initially for a 4.5 m Tunnel which has to be Redrawn to a 5.2 m Tunnel so it Fits into the Overall DESY 3D Model**
- **It is Likely that Each Region will Develop a Separate 3D Model During the TDP II Effort**
- **This will Require an Increased Level of Resources**

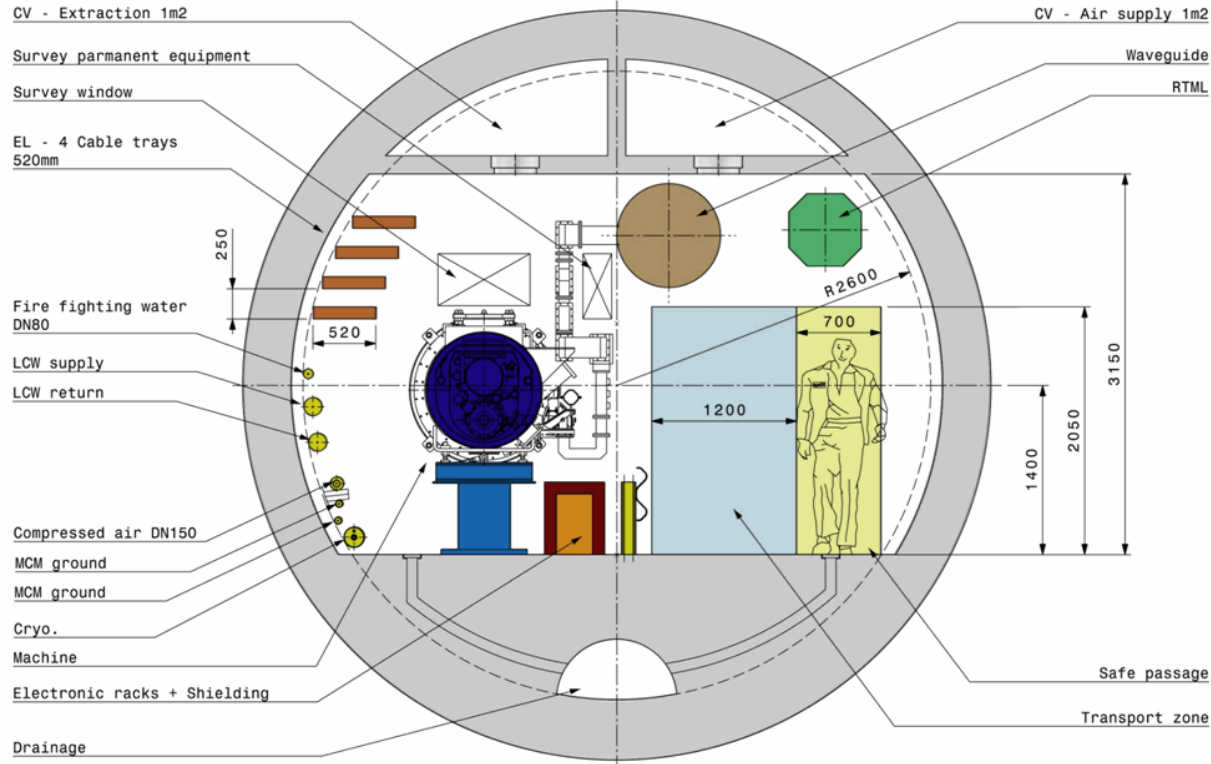
Regional Impacts for the CFS Effort

- **European Region**

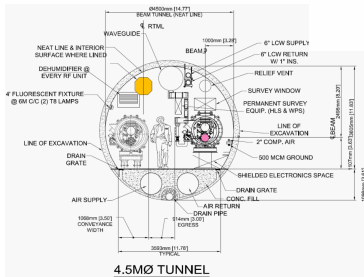
- **Focus is on the Klystron Cluster RF System because :**
 - *Geology is not Conducive to Ceiling Mounted Loads*
 - *Not compatible with ventilation concept*
 - *Tolerance issues*
 - *Safety during installation*
 - *Difficult to transfer horizontal forces into tunnel lining*
 - *LHC rejected this concept*
 - *This study will be developed more in Beijing*
- **Most Klystron Cluster RF Equipment is Located on the Surface**
- **Supply and Exhaust Duct Size w/Respect to the Compartmentalized Approach to Life Safety and Egress Issues Requires the 5.2 m Tunnel Diameter**
- **Cavern and Enclosure Shape Due to Geologic Conditions (Ceiling Profiles are Semicircular in Shape)**



European Region

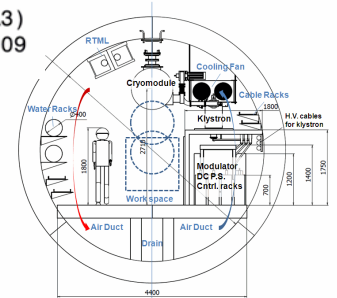


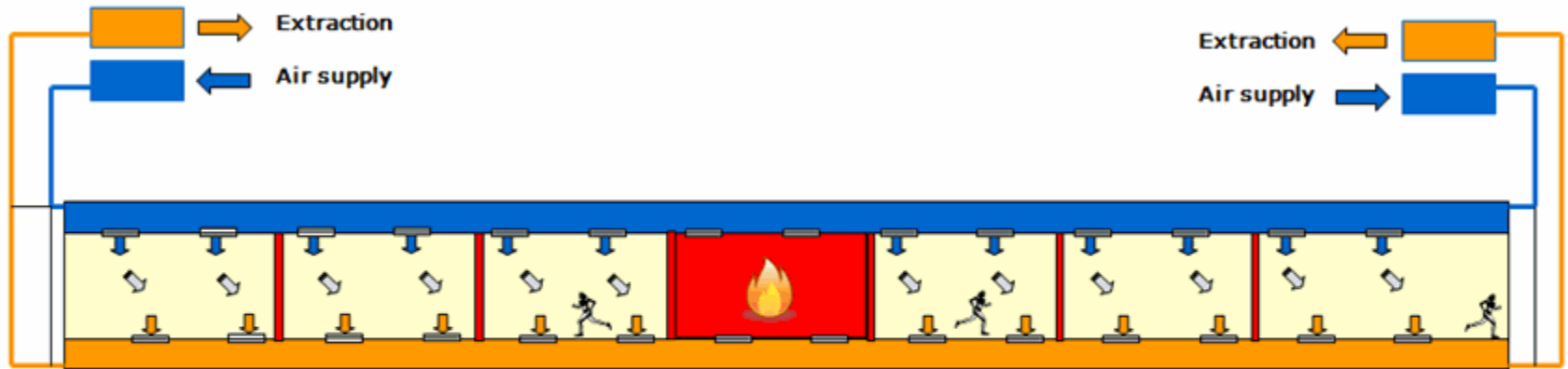
ILC - Typical Cross Section - Diameter 5200mm - Scale 1:25 (A3)
 KLY CLUSTER EUROPE - J.Osborne / A.Kosmicki - November 6th 2009



Americas Region

Asian Region





SHAFT POINT

- Control of the pressure from both ends of a sector.
- Control of the pressure (overpressure or underpressure in each area).
- Fire detection per sector compatible to fire fighting via water mist.

Schematic Diagram of Asian and European Compartmentalization Concept



Status of CFS Cost Estimates

- *The Americas Region has Developed the Following Cost Estimates and Provided Them to the Cost Group:*
 - *Full Cost Estimate Based on the Machine Layout Developed and the Current AD&I Machine Layout Drawings*
 - *Main Linac Klystron Cluster High Power Option*
 - *Main Linac Klystron Cluster Low Power Option*
 - *Main Linac DRFS High Power Option*
 - *Main Linac DRFS Low Power Option*
 - *Main Linac Tunnel Alternative Study*
- *All of These Cost Estimates are Based on the Current Technical Beamline Layout and the Current 2D CFS Enclosure Layout Posted on the EDMS System*
- *The Asian Region has Developed a Preliminary Cost Estimate for the DRFS High Power Option*
- *The European Region will Begin to Develop Cost Estimates as Resources Become Available and when new baseline is clearer*

Summary

- *The European CFS Group will focus on the following areas in 2010 :*
- *3d models using CATIA for the 'CERN' geology*
- *Kly Cluster v DRFS single tunnel solution*
- *Transport / Installation study*
- *CFS costing for new baseline*