Status projektu ILC:
wrażenia ze spotkania GDE/ECFA w Walencji

Collider and Astroparticle Physics
2006/2007

A.F.Żarnecki
22-11-2006

Next e+e- collider must be linear

- Synchrotron Radiation (SR) becomes prohibitive for electrons in a circular machine above LEP energies:

$$U_{SR}[\text{GeV}] = 6 \cdot 10^{-21} \cdot \gamma^4 \cdot 1/r[\text{km}]$$

U_{SR} = energy loss per turn
γ = relativistic factor
r = machine radius

- RF system must replace this loss, and r scale as E^2
- LEP @ 100 GeV/beam: 27 km around, 2 GeV/turn lost
- Possible scale to 250 GeV/beam i.e. E_{cm} = **500 GeV**:
  - **170 km** around
  - **13 GeV/turn** lost

$\gamma_{250GeV} = 4.9 \cdot 10^5$

- Consider also the luminosity
  - For a **luminosity of ~ 10^{34}/cm^2/second**, scaling from b-factories gives ~ 1 Ampere of beam current
  - 13 GeV/turn x 2 amperes = **26 GW RF power**
  - Because of conversion efficiency, this collider would consume more power than the state of **California in summer: ~ 45 GW**

Circulating beam power = 500 GW

- Both size and power seem excessive

Brief ILC History

- Late 1980s and 1990s:
  - Next Linear Collider:
    - SLAC/KEK warm RF designs
    - NLC detector group
  - TESLA:
    - European superconducting RF design
    - ECFA-DESY physics/detector studies →
      - 1st ECFA/DESY study: 1996/97
      - 2nd ECFA/DESY study: 1998/2000
      - Extended Joint ECFA/DESY study: 2001/2003
      - ECFA study: 2003/2005
    - \+ World-Wide Study of Physics & Detectors

→ **International Linear Collider Workshops organized starting 1991**

- 2000s:
  - Snowmass 2001
  - HEPAP recomendation 2002
  - "Understanding Matter, Energy, Space and Time: The Case for the e+e- Linear Collider" 2003

TESLA TDR: 2001

GLC Project Report: 2003

500 *(→ 800)* GeV e+e- Linear Collider

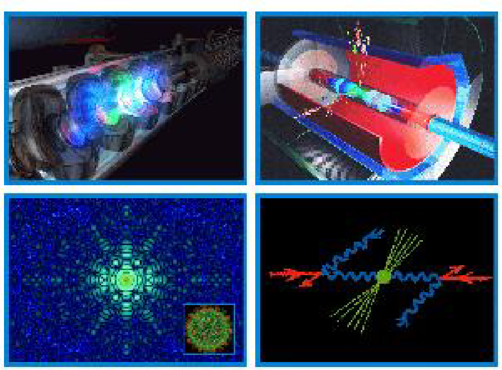
Based on superconducting linac technology

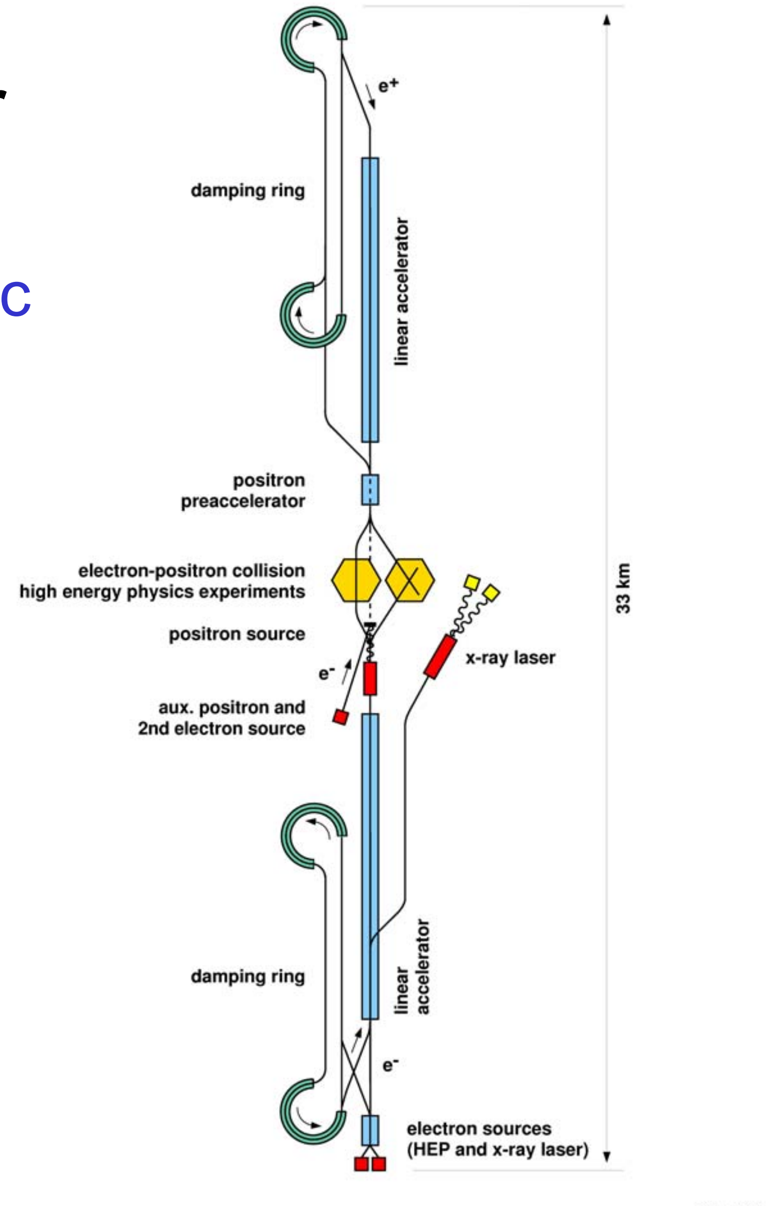
TESLA

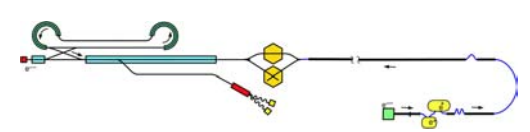
The Superconducting Electron-Positron Linear Collider

with an Integrated X-Ray Laser Laboratory

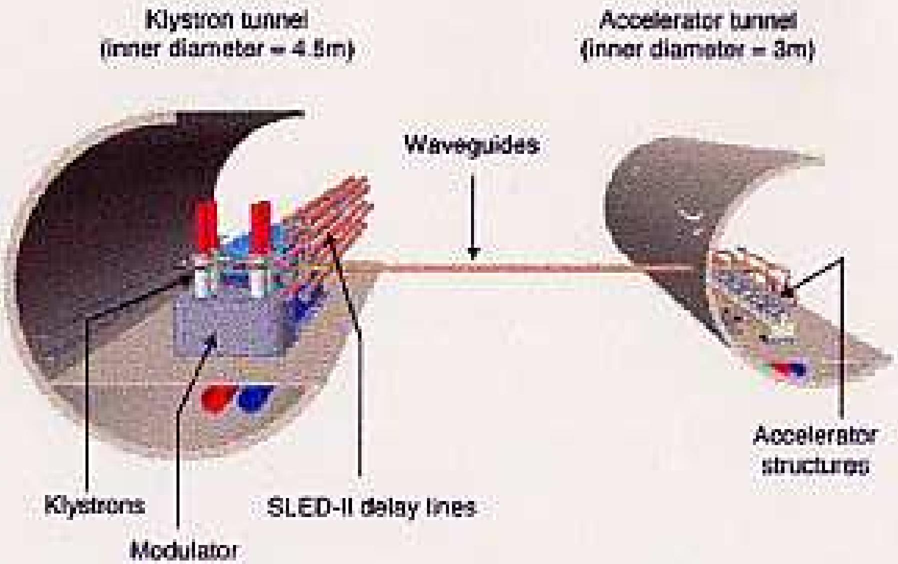
Technical Design Report

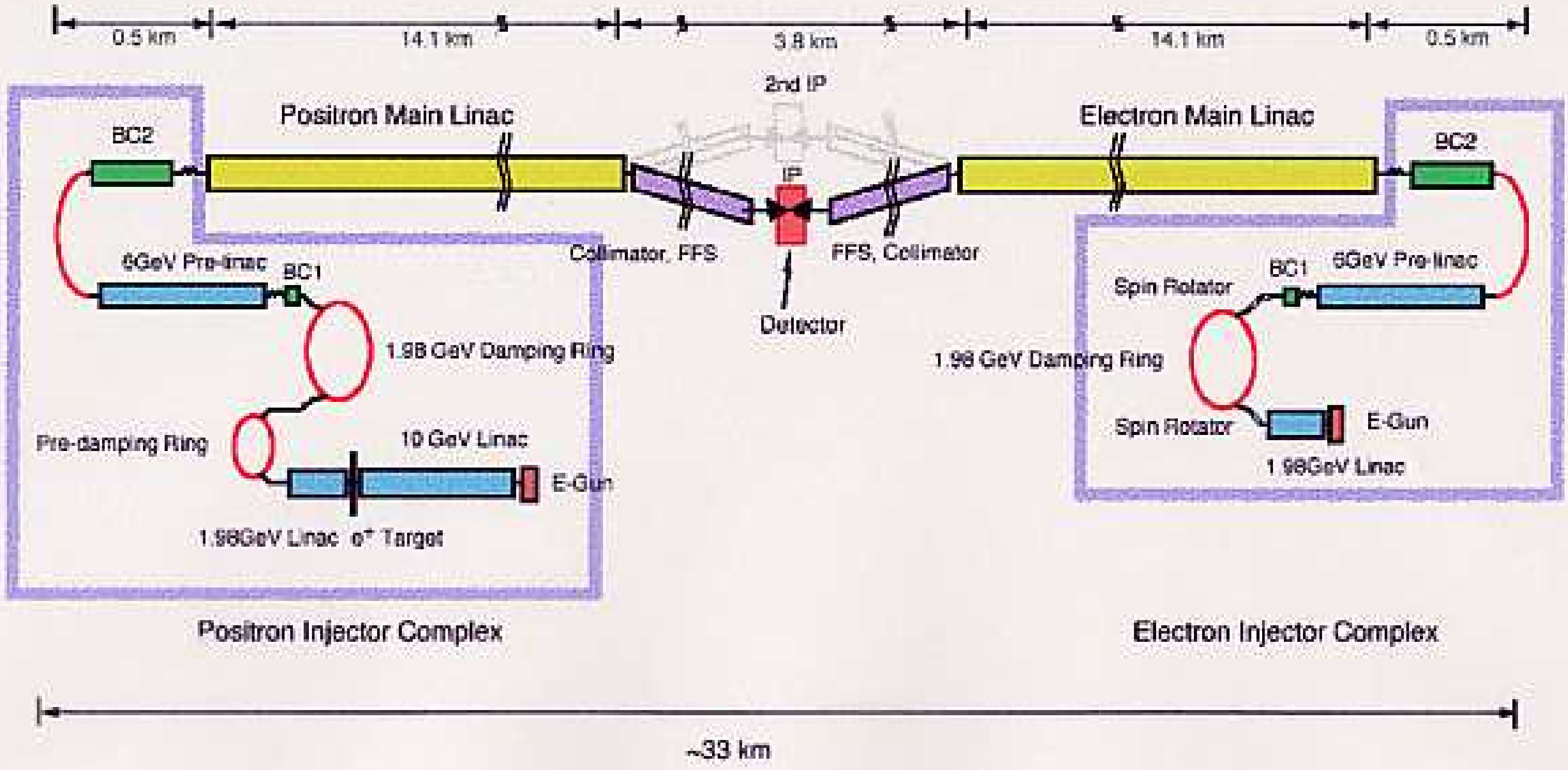






JLC/NLC Linear Collider Warm RF, 11.4 GHz, Loaded gradient=50 MV/m, site ~33 km=>E_{max}(cm)=1.0-1.3 TeV





ICFA International Committee

ICFA and the Linear Collider

- ICFA has been helping guide international cooperation on the Linear Collider since the mid 1990's.
- Reason: World-wide consensus that 500 GeV e+e- linear collider (upgradeable to ~1 TeV) is next major accelerator following LHC

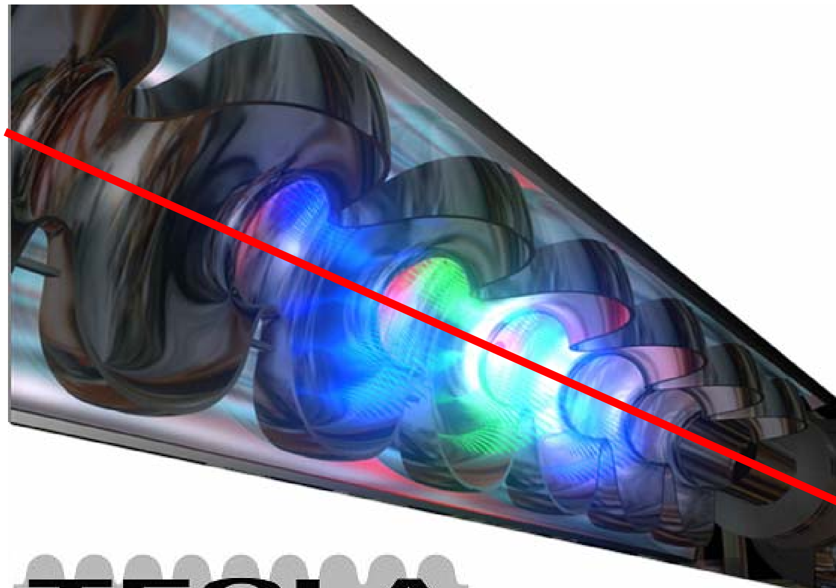
1995: First ILC TRC Report, under Greg Loew as Chair

1999: ICFA Statement on Linear Collider

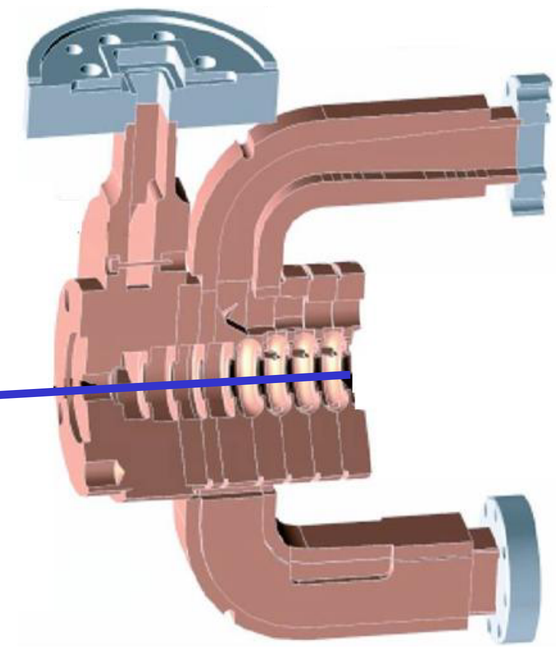
2002: ICFA commissioned the second ILC TRC Report, under Greg Loew as Chair

2002: ICFA establishes the International Linear Collider Steering Group (ILCSC) with Maury Tigner as Chair

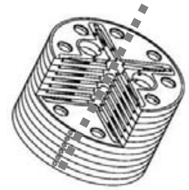
Competing technologies



1.3 GHz - Cold



11.4 GHz - Warm



30 GHz-Warm

Linear Collider Parameter Overview

	NLC/JLC	TESLA	CLIC	SLC
f / GHz	11.4	1.3	30	2.9
E-cms / GeV	500 – 1000	500 – 800	3000 – 5000	100
g / MV/m	50	23 – 35	150	~20
Lumi / 10^{34}	2 – 3	3.4 – 5.8	~10	.0003
Power p. beam / MW	6.9 – 13.8	11.2 – 17	~15	0.04
σ_y at IP / nm	2.7 – 2.1	5 – 2.8	1	500
Beamstrahlung δB / %	3.2 – 4.3	3.4 – 7.5	21	<0.1
Site length / km	30	33	~35	3.5
Site power / MW	195 – 350	140 – 200	~400	
Cost§ (stage-I)	~3.5B$	3.14B€+7k p.y.		?

§ numbers quoted at Snowmass 2001, no pre-operation, escalation and contingency included

Accelerator designs

Parameters for the Linear Collider

September 30, 2003

- BASELINE MACHINE
  - E_{CM} of operation 200-500 GeV
  - Luminosity and reliability for 500 fb^{-1} in 4 years
  - Energy scan capability with <10% downtime
  - Beam energy precision and stability below about 0.1%
  - Electron polarization of > 80%
  - Two IRs with detectors
  - E_{CM} down to 90Gev for calibration
- UPGRADES
  - E_{CM} about 1 TeV
  - Allow for ~1 ab^{-1} in about 3-4 years
- OPTIONS
  - Extend to 1 ab^{-1} at 500 GeV in ~ 2 years
  - e^-e^-, $\gamma\gamma$, $e^-\gamma$, positron polarization
  - Giga-Z, WW threshold

http://www.fnal.gov/directorate/icfa/LC_parameters.pdf

The Charge to the International Technology Recommendation Panel

General Considerations

The International Technology Recommendation Panel (the Panel) should recommend a Linear Collider (LC) technology to the International Linear Collider Steering Committee (ILCSC).

On the assumption that a linear collider construction commences before 2010 and given the assessment by the ITRC that both TESLA and JLC-X/NLC have rather mature conceptual designs, the choice should be between these two designs. If necessary, a solution incorporating C-band technology should be evaluated.

Note -- We have interpreted our charge as being to recommend a technology, rather than choose a design

Some of the Features of SC Technology

- **The large cavity aperture and long bunch interval reduce the complexity of operations, reduce the sensitivity to ground motion, permit inter-bunch feedback and may enable increased beam current.**
- **The main linac rf systems, the single largest technical cost elements, are of comparatively lower risk.**
- **The construction of the superconducting XFEL free electron laser will provide prototypes and test many aspects of the linac.**
- **The industrialization of most major components of the linac is underway.**
- **The use of superconducting cavities significantly reduces power consumption.**

Both technologies have wider impact beyond particle physics. The superconducting rf technology has applications in other fields of accelerator-based research, while the X-band rf technology has applications in medicine and other areas.

ICFA International Committee

ILC

- At ICHEP 2004 (Beijing) ICFA endorsed the Technology Recommendation made by the ITRP
- This led to a major convergence of world-wide efforts towards the LC
- GDE, with director Barry Barish, formed in early 2005
- GDE produced Baseline Configuration Document (BCD) in late 2005; now under configuration control

ILC Documents

Brochure – non-technical audiences, ready now
"Quantum Universe" level booklet ~30 pages

Executive Summary ~ 30 pages
 Physics motivation, accelerator and detectors

RDR Report ~ 300 pages
 high level description of the accelerator

DCR Report ~ 250 pages
 physics and detectors

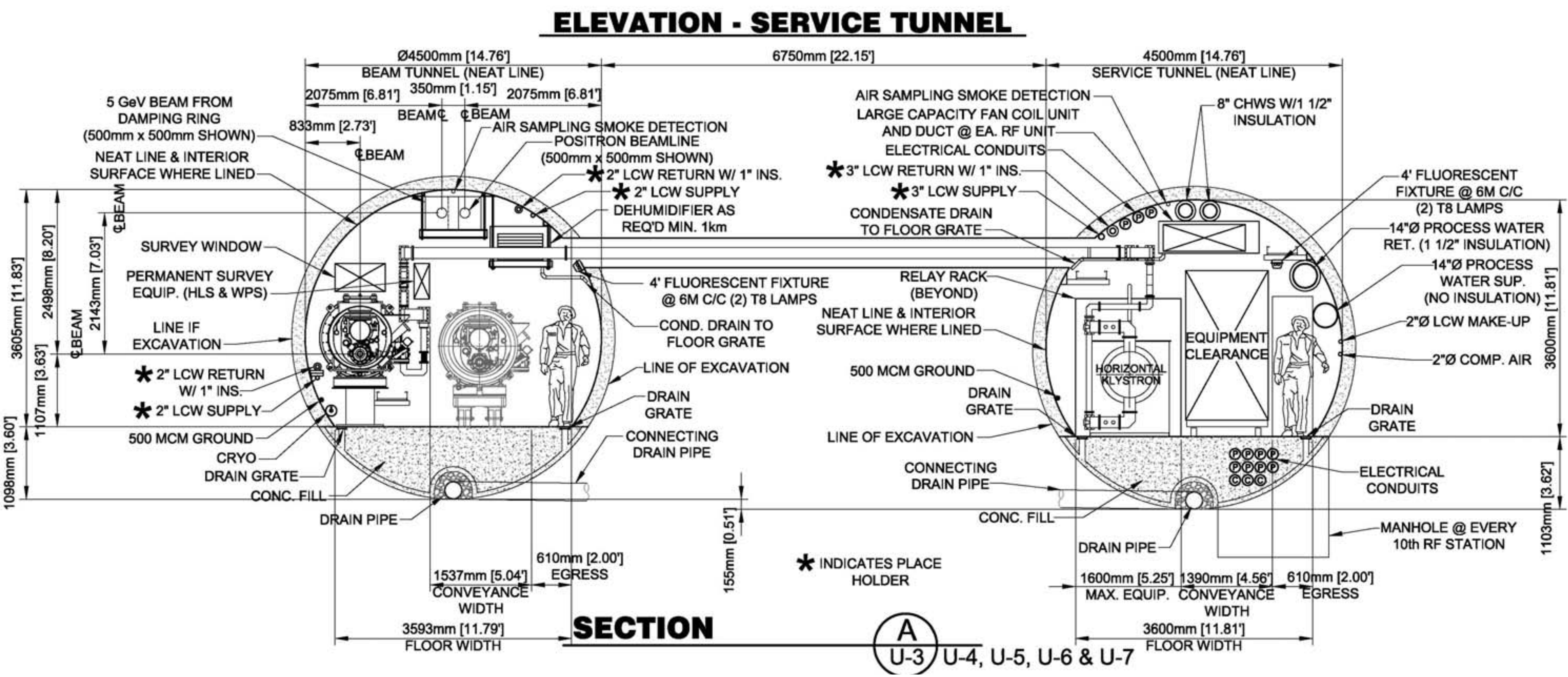
RDR Editors:
 Nan Phinney (SLAC), Nobu Toge (KEK), Nick Walker (DESY)

RDR Report

- RDR is a high level description of the accelerator, CFS, sites and costs
  - similar to 2001 Tesla TDR or 2003 GLC Report
- A snapshot of what we propose to build
  - not a history of R&D, design evolution, and alternatives
- Original schedule was complete draft now, but has been pushed back because of cost iterations
- We have in hand a working outline for the RDR and outlines or drafts of many sections

Examples of Civil Engineering Layouts (1)

From CFS - Fermilab



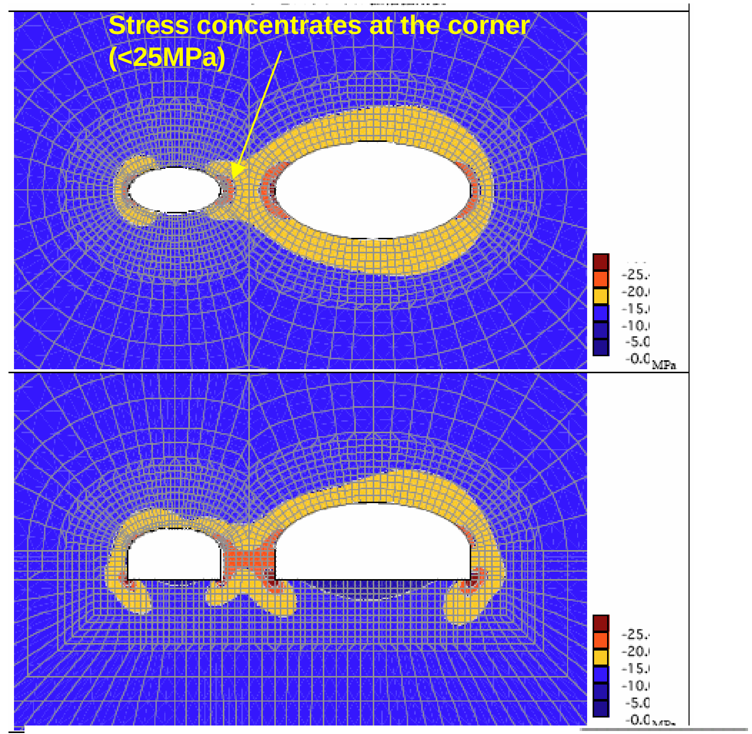
Example of Civil Engineering Study (8)

From CFS - KEK

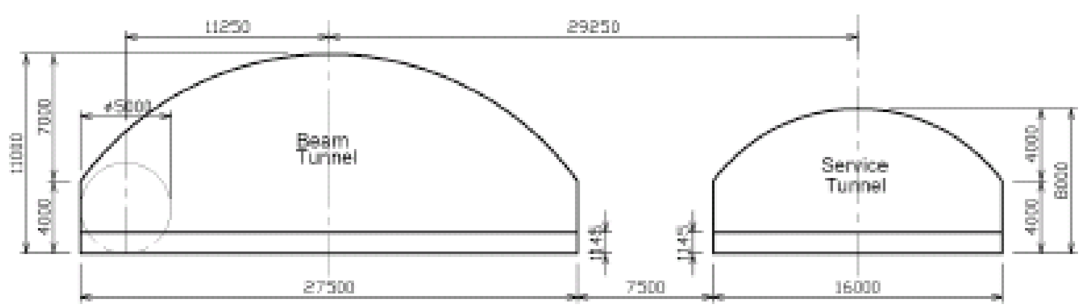
Design of the underground cavern

Positron Generator Hall

Positron generator hall in "1.2km area" of the e- Beamline.



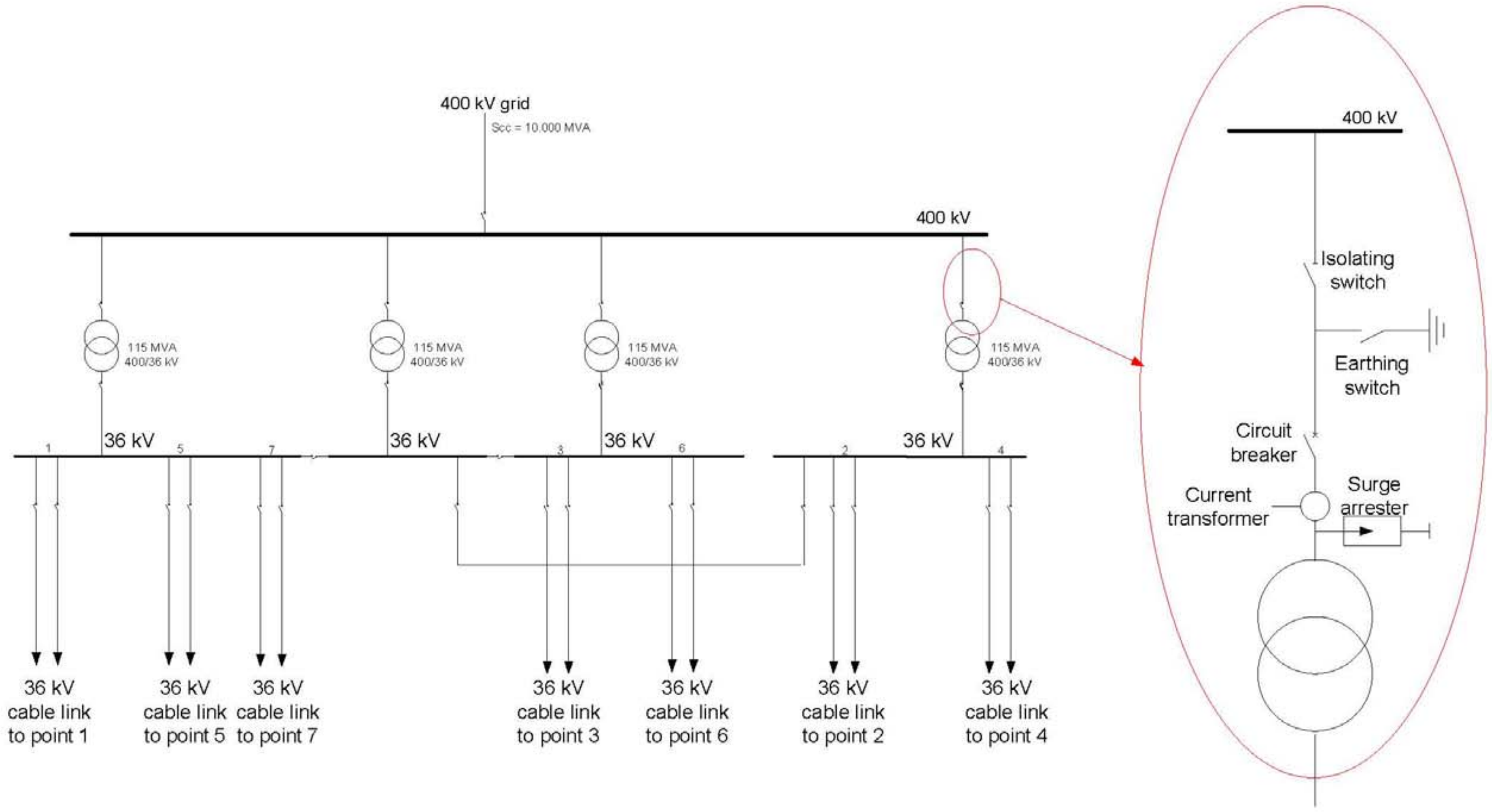
- Design depends on the geology
- Compressive strength of the Asian site is ~100Mpa
- Isotropic stress.
- Need no concrete lining.



sec. A – A'

Examples of Electrical Layouts (1)

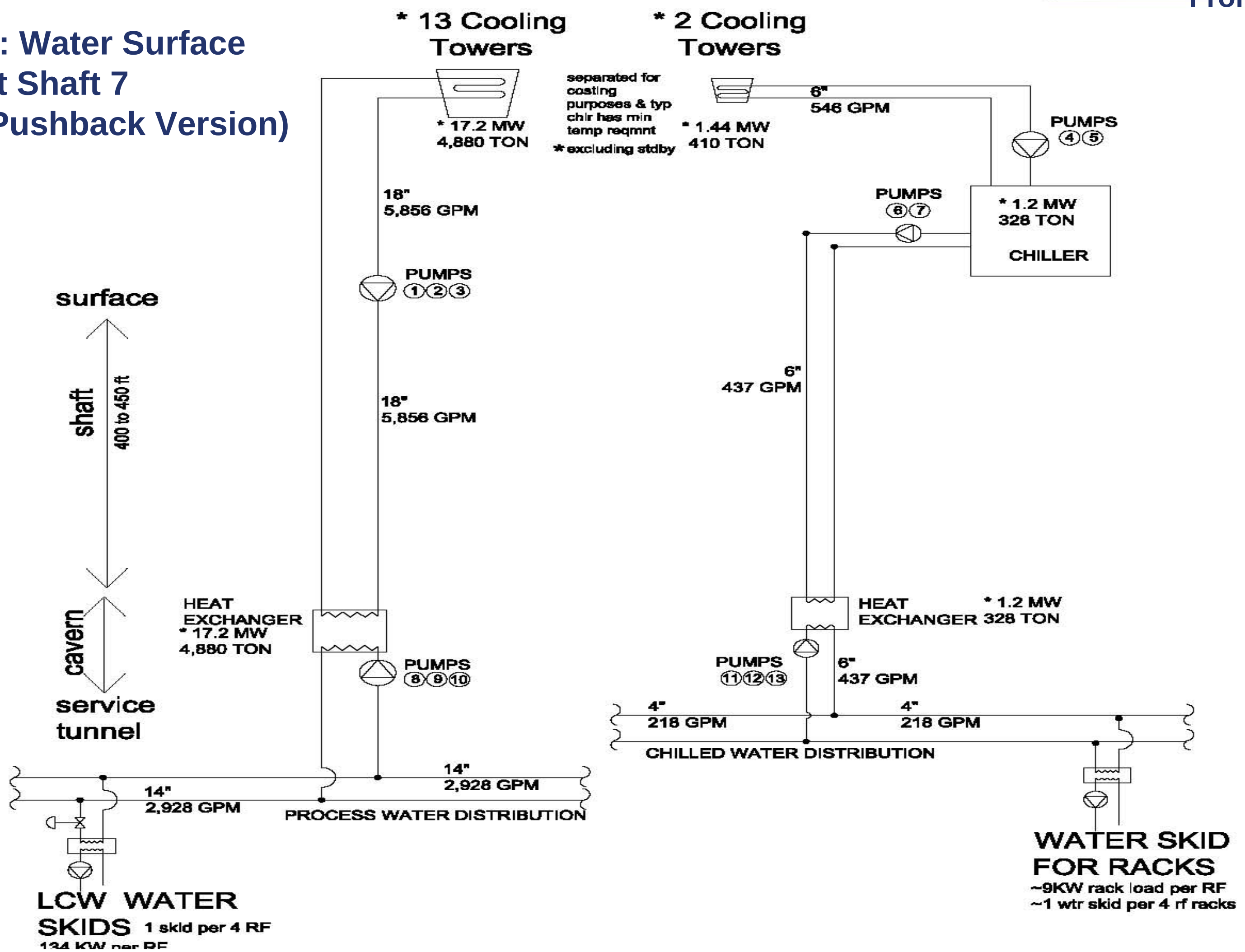
From CFS - CERN



ILC Top-level distribution
400 kV/ 36 kV substation
Principle

From CFS - Fermilab

BASIS : Water Surface Plant at Shaft 7 (Load Pushback Version)



Specificities for each Sample Site – AMERICAS

Situation :

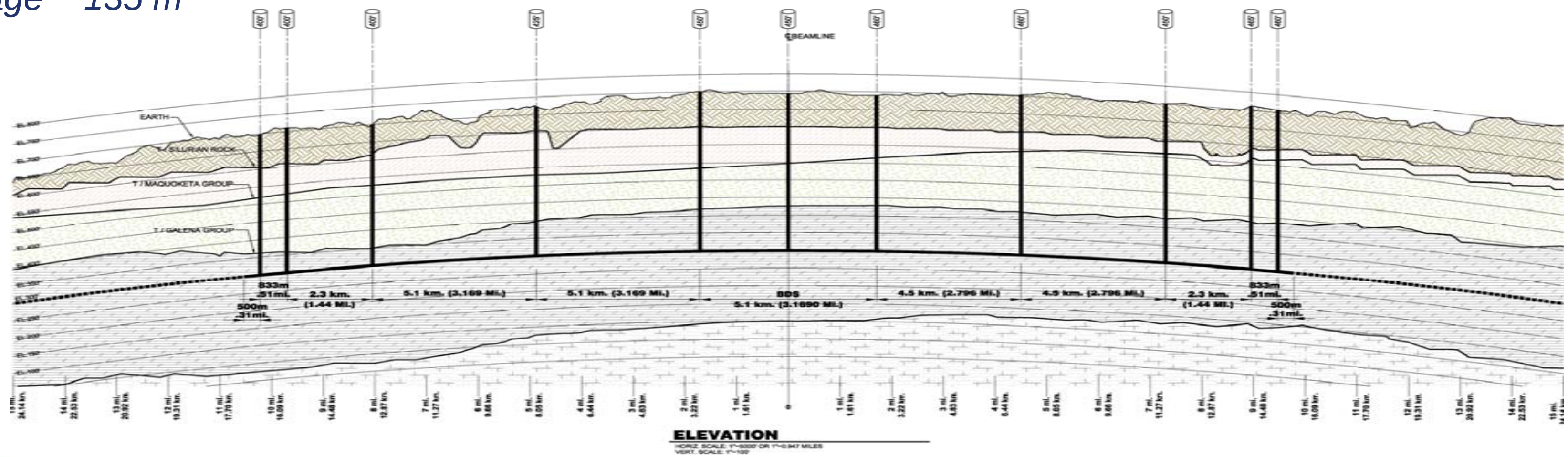
In solid rock, close to existing institute, close to the city of Chicago and international airport, close to railway and highway networks.

Geology :

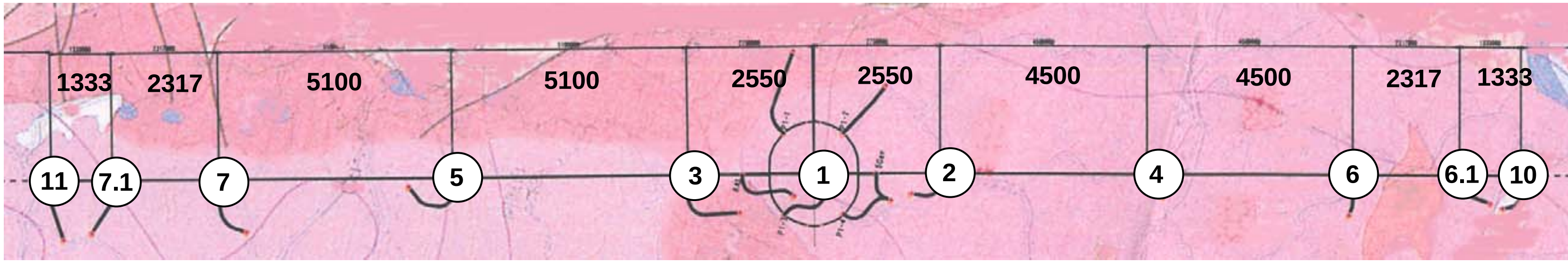
Glacially derived deposits overlaying Bedrock. The concerned rock layers are from top to bottom the Silurian dolomite, Maquoketa dolomitic shale, and the Galena-Platteville dolomites.

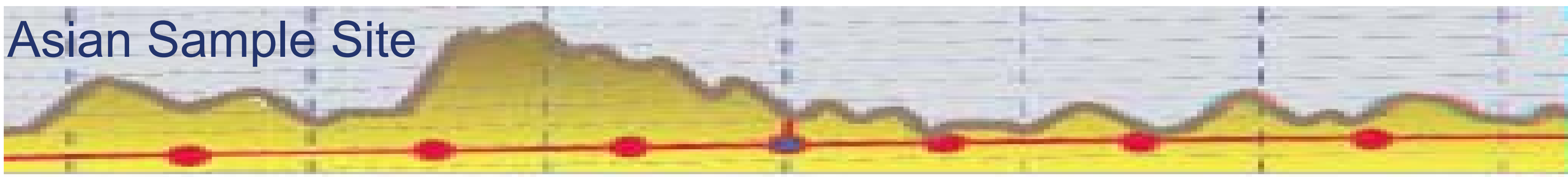
Depth of main tunnels:

Average ~ 135 m



Specificities for each Sample Site - ASIA





- Following requirements were imposed for the sample site:
- Firm and uniform geology.
- Large enough area spanning over 50km.
- Absence of active dislocations, wide faults in the neighbourhood.
- Absence of epicenters of earthquakes exceeding M6 within 50km from anywhere in the site since AD1500.
- Terrain uniformity to maintain the ILC Tunnel depths less than 600m anywhere. Granite (compressive strength~100MPa).
- Excavation: TBM (~300m/month)
- Finish: Sprayed concrete (+ Rock-bolts)
- Access by sloped tunnel instead of vertical shafts

Point	Elevation (m)	Access Tunnel Diatance (m)
11	178	1323
7	330	1455
5	344	1636
3	493	1842
1	228	(148)*
2	188	992
4	173	671
6	161	887
10	160	960
12	312	1178
13	192	1235
14	247	1382
15	361	1945
Beamline	80	

* Access shaft

Specificities for each Sample Site – CERN

Situation :

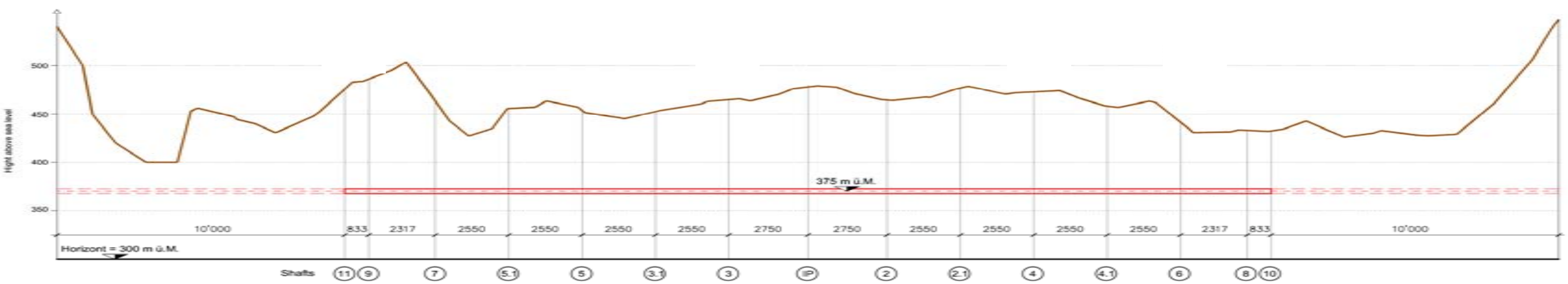
Proximity of CERN existing site with its 400 kV grid connection. Close to the city of Geneva with its international airport, railway and highway network connections.

Geology :

Solid and stable bedrock called "molasse" (sandstone), which stretches between the Jura mountains and the Lake of Geneva. A layer of moraines ranges from 0 to 50 m on top of the sandstone. Low seismic activity and no active faults.

Depth of main tunnels :

average ~ 100 m



Specificities for each Sample Site – DESY

Situation :

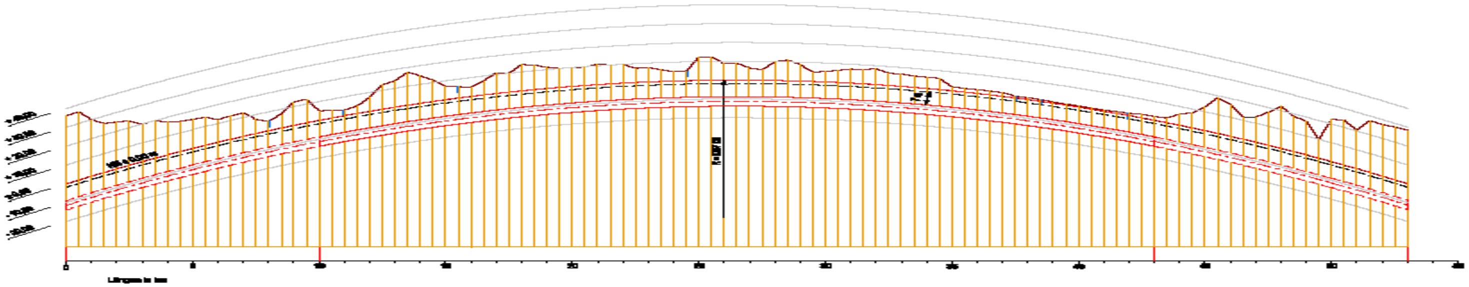
Close to DESY existing site and the city of Hamburg with its international airport and seaport. The ILC layout will follow closely the TESLA layout on the first 32.8 km and could then be extended to 50 km in the same direction. Close to railway and highway network connections.

Geology :

Quaternary sand and smaller part in marl. Tunnel situated below the ground water table over nearly the entire length.

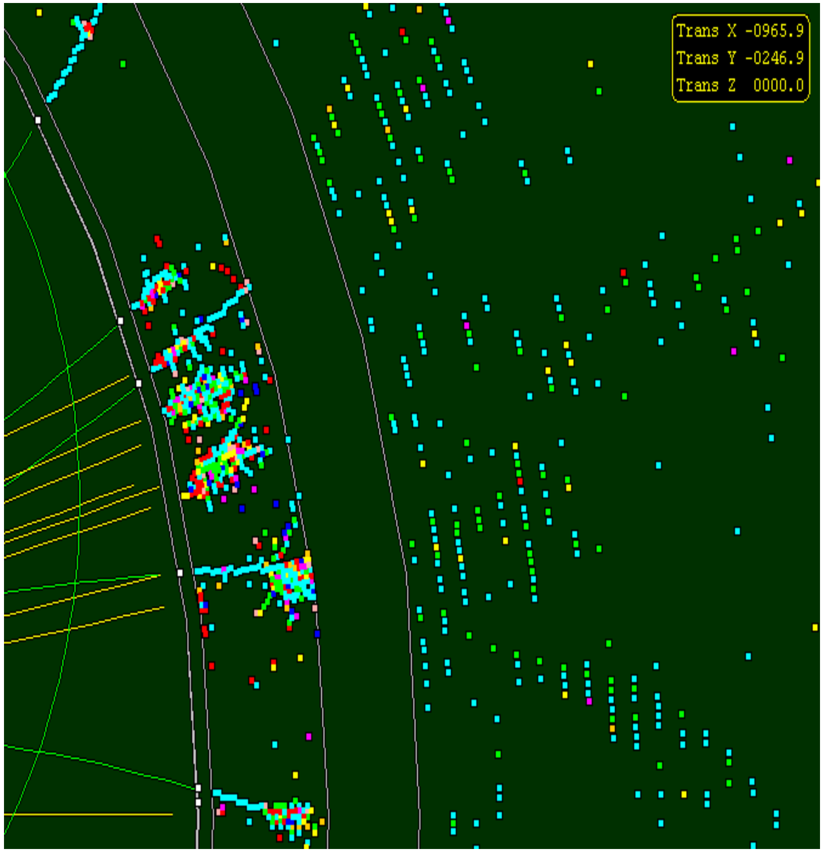
Depth of main tunnels :

Shallow position, average ~ 18 m



HCAL simulation

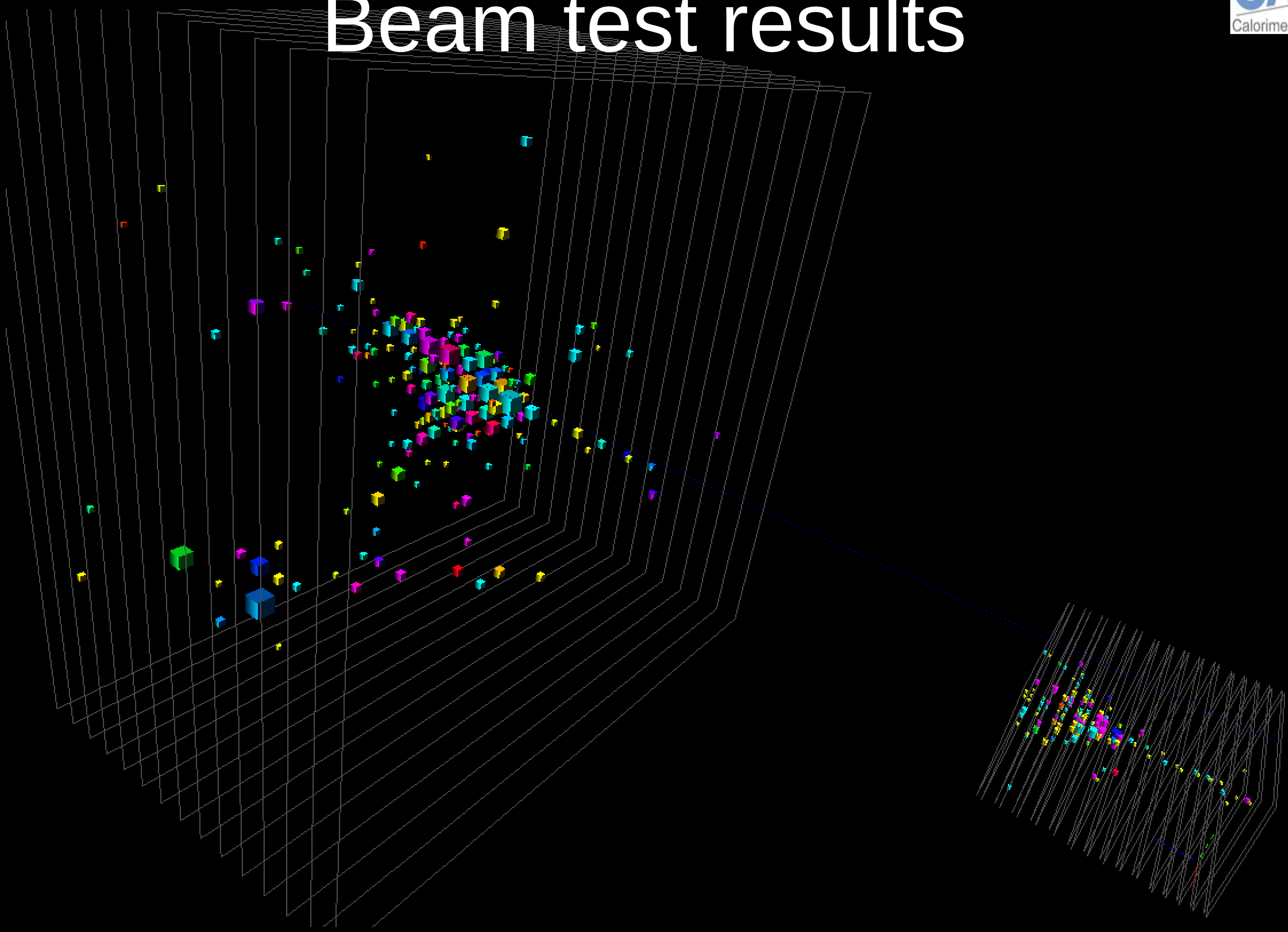
- Inside the coil
- R_{in}= 1.42m; R_{out}= 2.44m
- 4λ Fe (or W, more compact)
  2cm Fe, 1cm gap
- Highly segmented
  1x1 cm^2 – 3x3 cm^2
  ~ 40 samples in depth
- Technology?
  RPC
  Scint Tile
  GEM

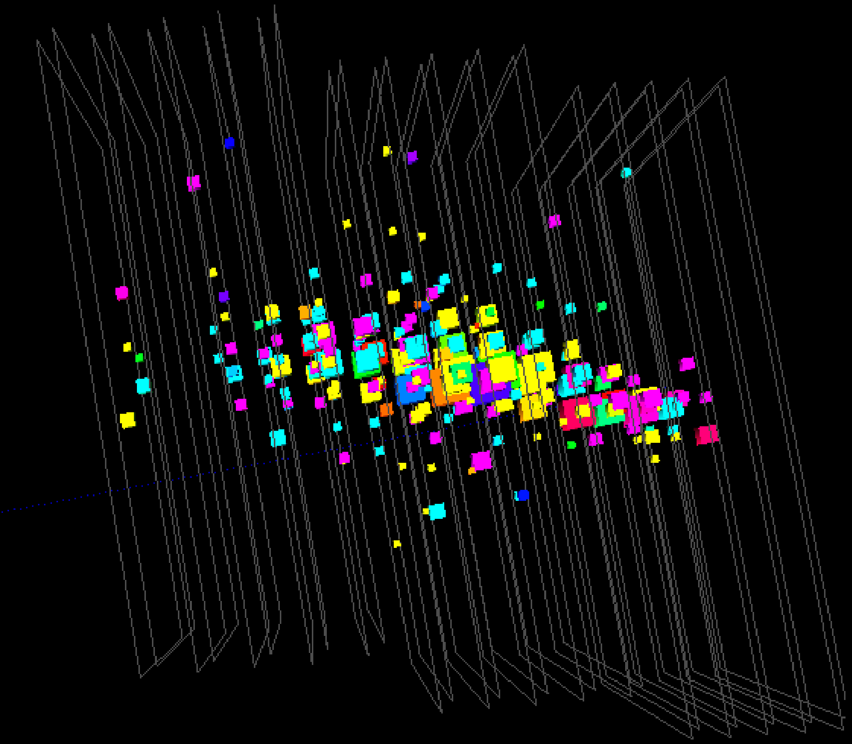


S. Magill (ANL)

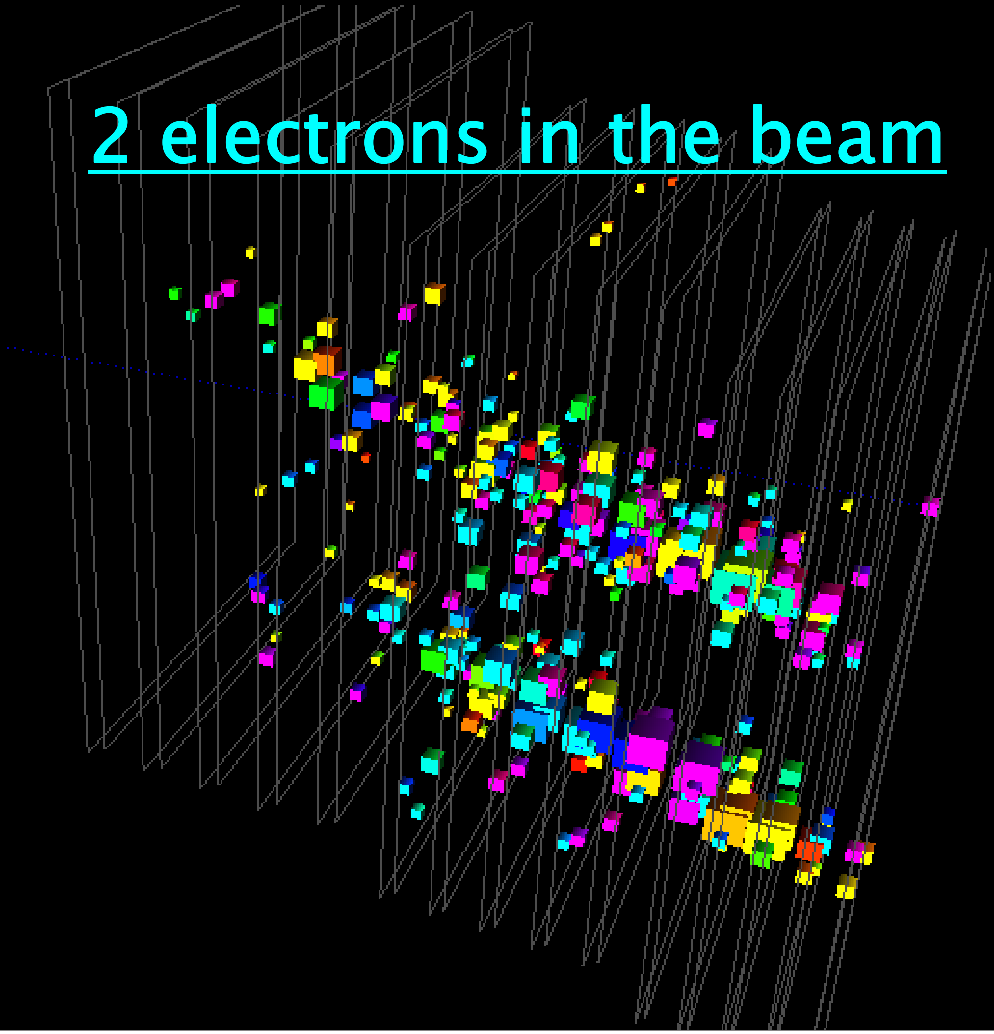
…many critical questions for the SiD Design Study: thickness? Segmentation? Material? Technology?

Beam test results

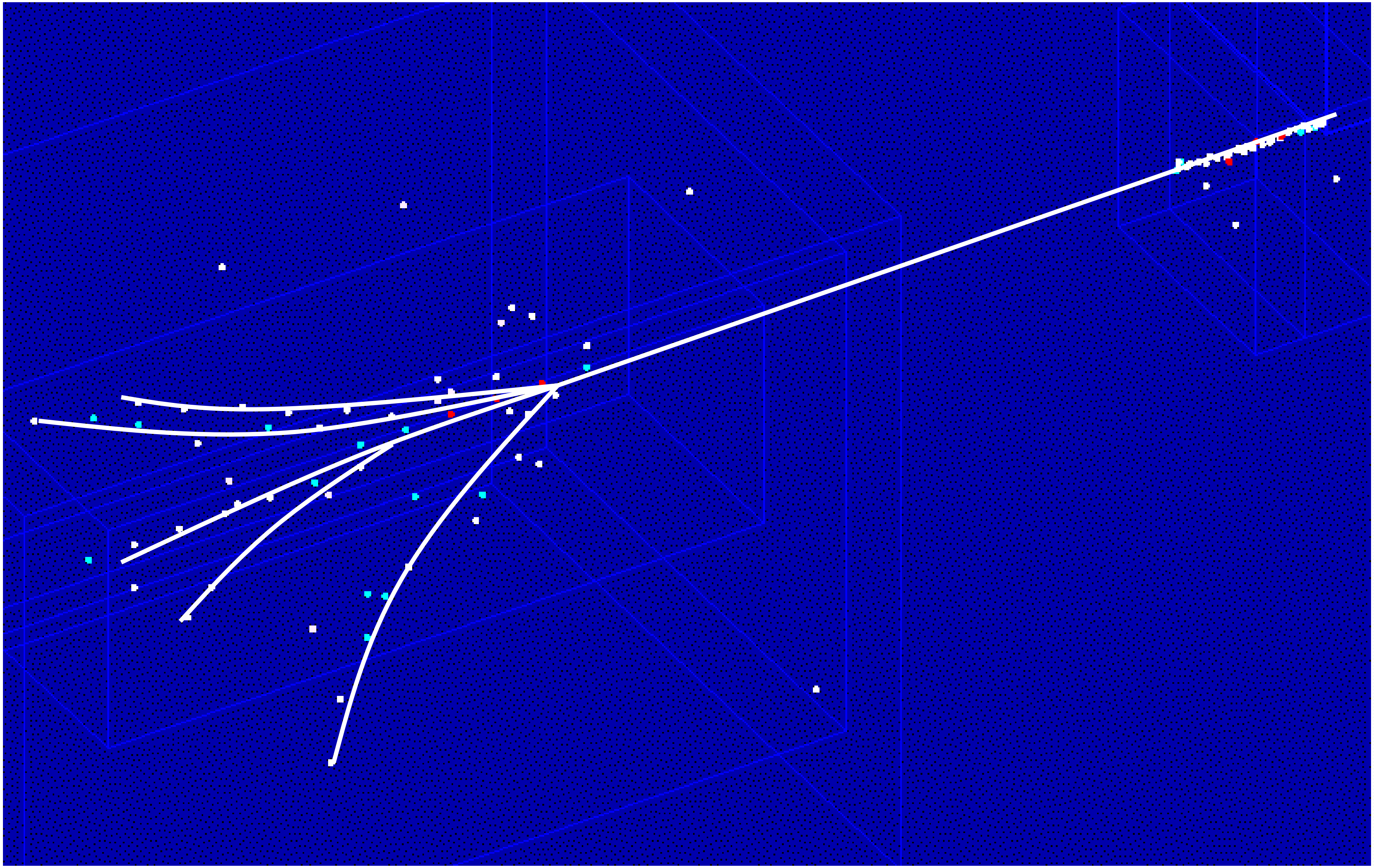




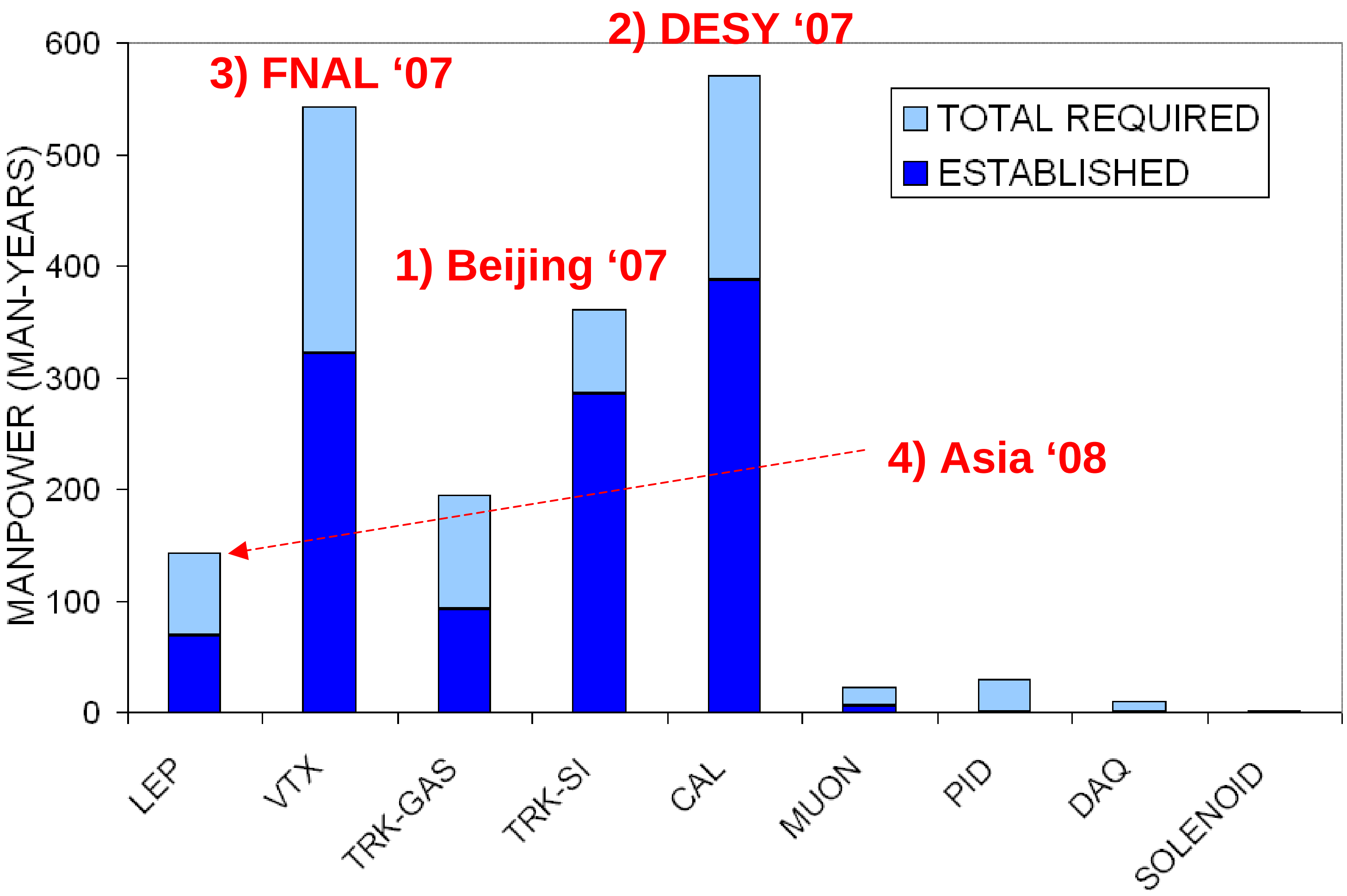
2 electrons in the beam



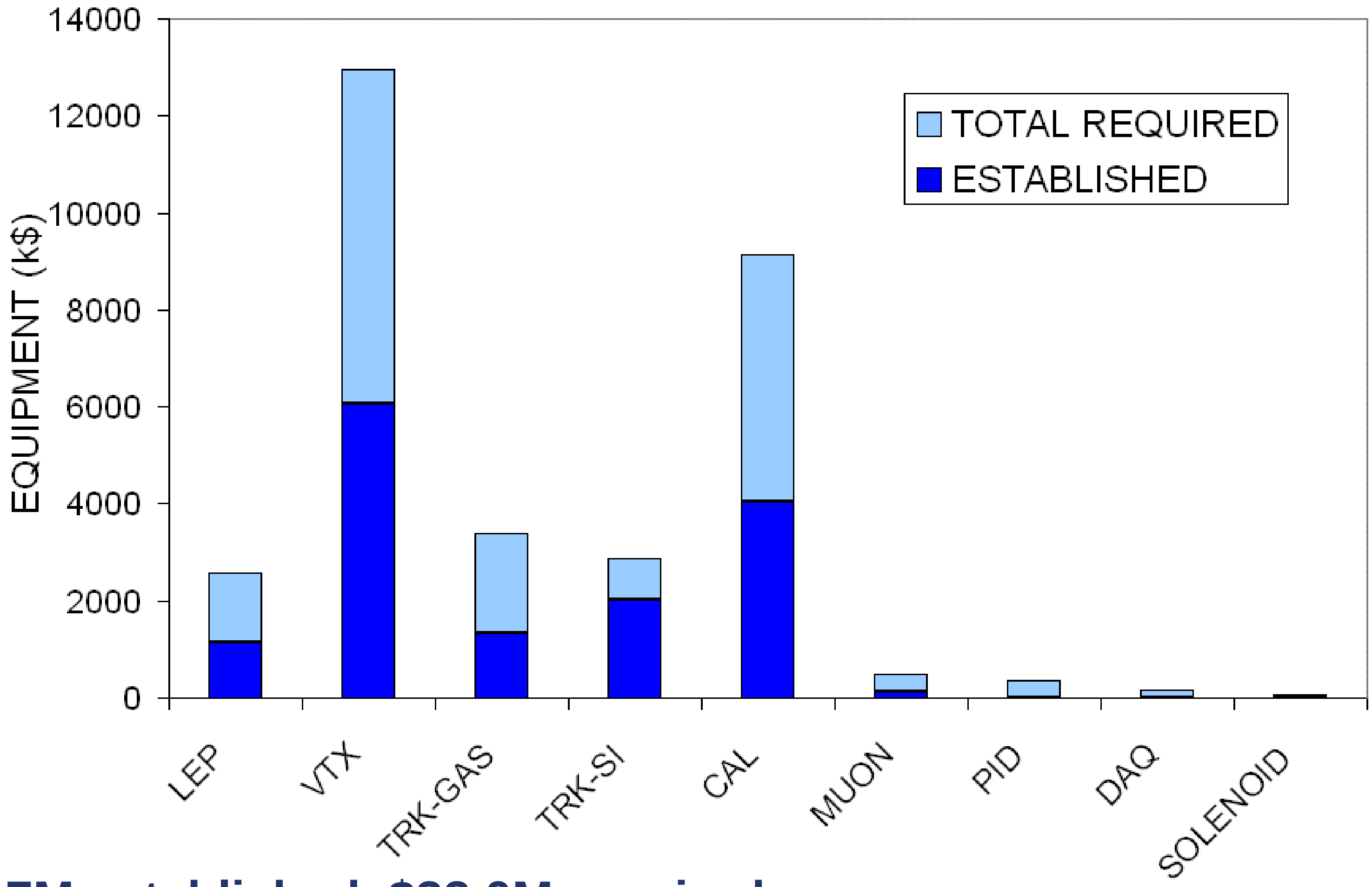
PFA on hadronic shower in TEST BEAM



Totals over 3-5 yrs, to completion of R&D



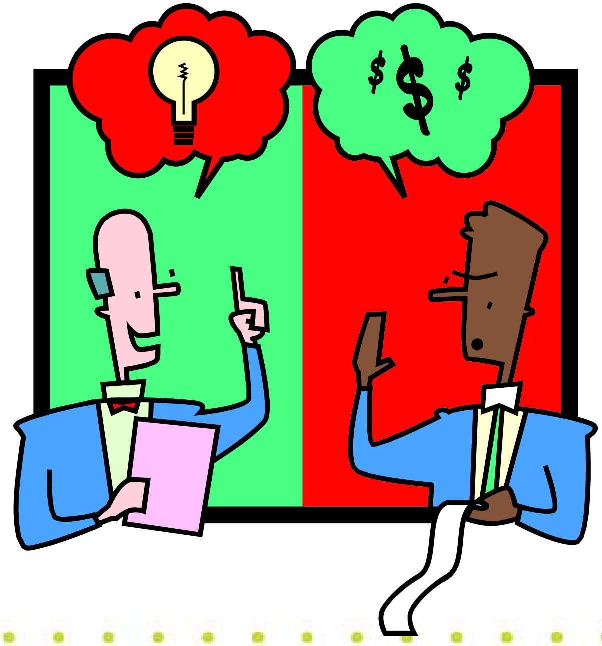
1163 man-yrs established, 1873 man-yrs required



$14.7M established, $32.0M required

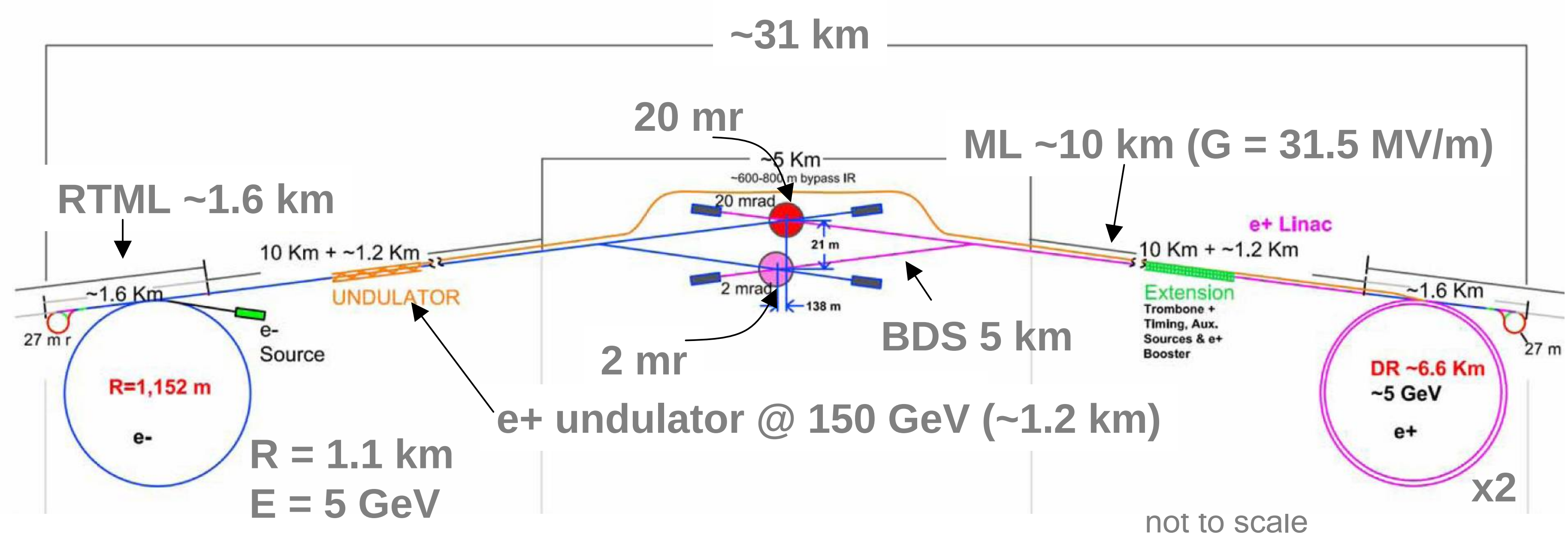
(adds 15% to manpower costs, assuming $100k p.a. average for staff)

GDE: Producing the Design and Cost Estimate



The Status at Vancouver (July '06)

Baseline Configuration



Configuration used for Vancouver cost estimate

fundamentally no different from Frascati BC, but much more detail design work

RDR matrix

Area Systems

e- source	e+ source	Damping Rings	RTML	Main Linac	BDS
	Kiriki	Gao	ES Kim	Hayano	Yamamoto
		Guiducci		Lilje	Angal-Kalinin
Brachmann	Sheppard	Wolski	Tenenbaum	Adolphsen	Seryi
Logachev		Zisman		Solyak	

Technical Systems

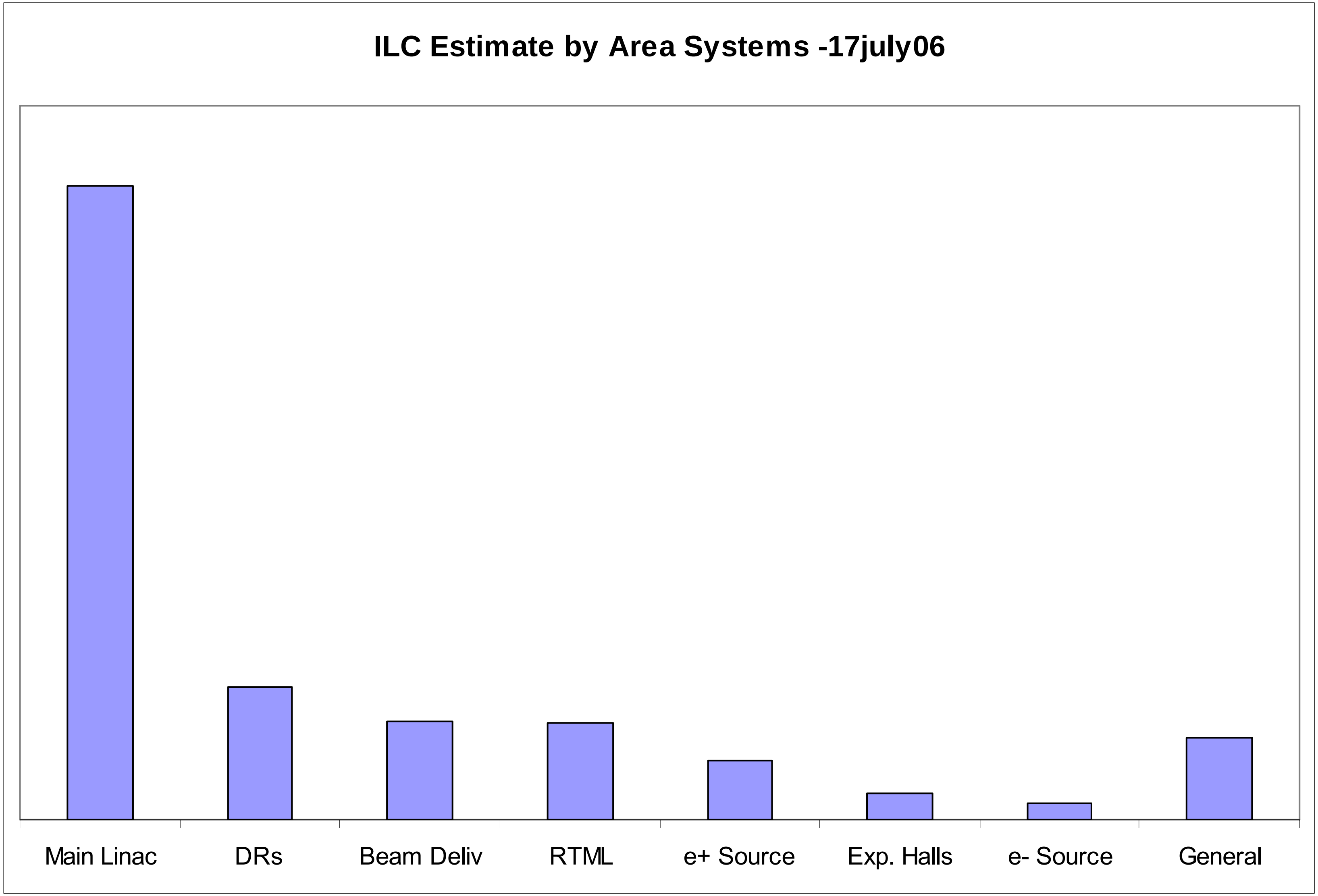
Vacuum systems	Suetsugu	Michelato	Noonan
Magnet systems	Sugahara	Bondachuk	Thomkins
Cryomodule	Ohuchi	Pagani	Carter
Cavity Package	Saito	Proch	Mammosser
RF Power	Fukuda		Larsen
Instrumentation	Urakawa	Burrows	Ross
Dumps/Collimators	Ban	Densham	Markiewicz
Acc. Physics	Kubo	Schulte	

Global Systems

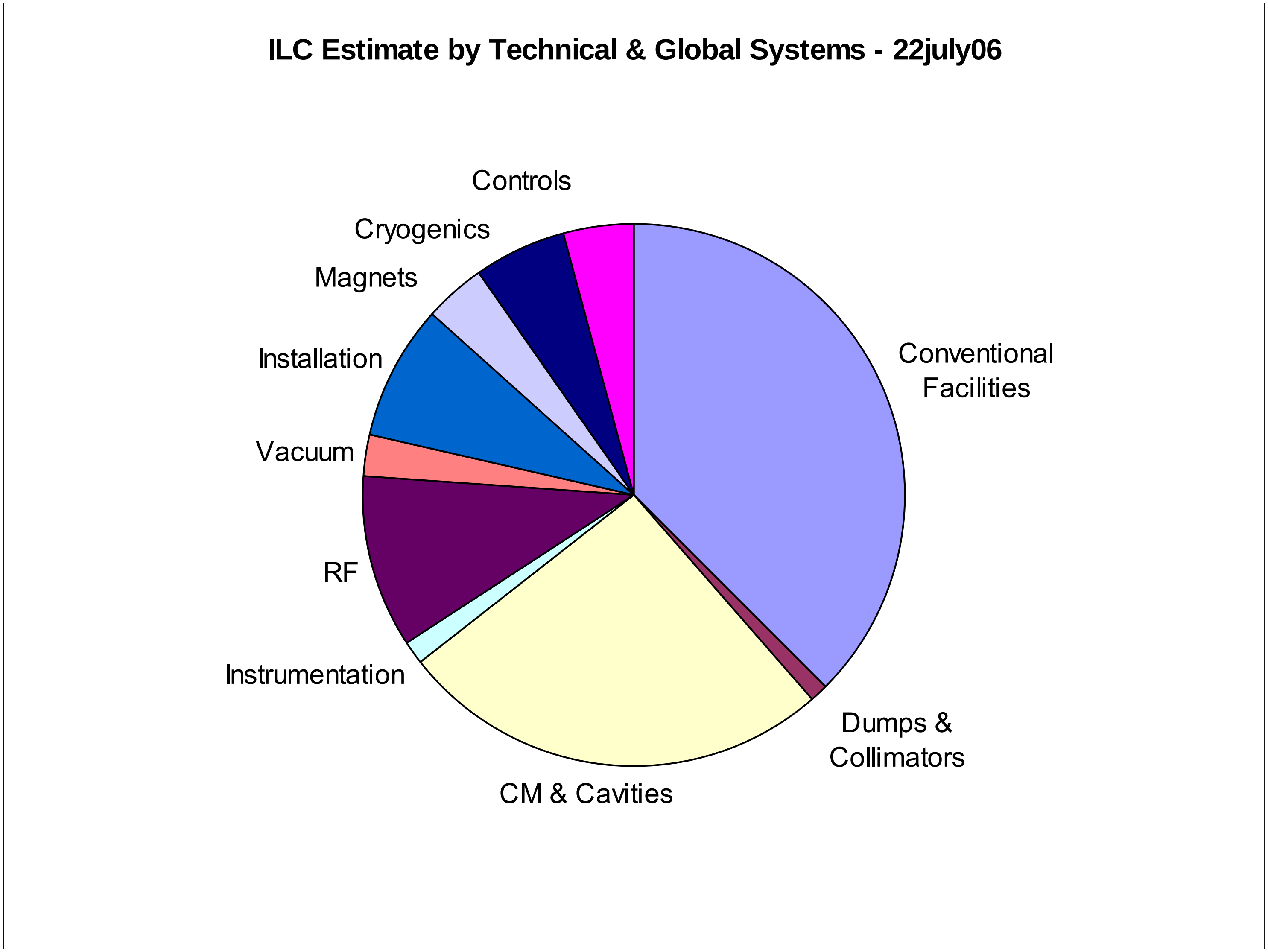
Ops. & Avail.	Teranuma	Elsen	Himel
Controls	Michizono	Simrock	Carwardine
Cryogenics	Hosoyama	Tavian	Peterson
CF&S	Enomoto	Baldy	Kuchler
Installation	Shidara	Bialwons	Asiri

RDR 'matrix' responsible for technical design and generating the cost estimate

Costs by Area System



Costs by Technical & Global System



Result of Vancouver

- Initial rough cost estimate ...

Result of Vancouver

Not! to scale!

- Initial rough cost estimate too high
  - **Not too surprised**
- Begin design and cost iteration
  - **Identify cost drivers**
- Cost estimate not as ‘mature’ as hoped
  - **Clear than more time will be needed to push back on costs**
- ~3 month delay to schedule
  - **Draft RDR+cost to be published at Beijing Feb. 07**

From Vancouver to Valencia:

Saving Money

Approach to Cost Reduction

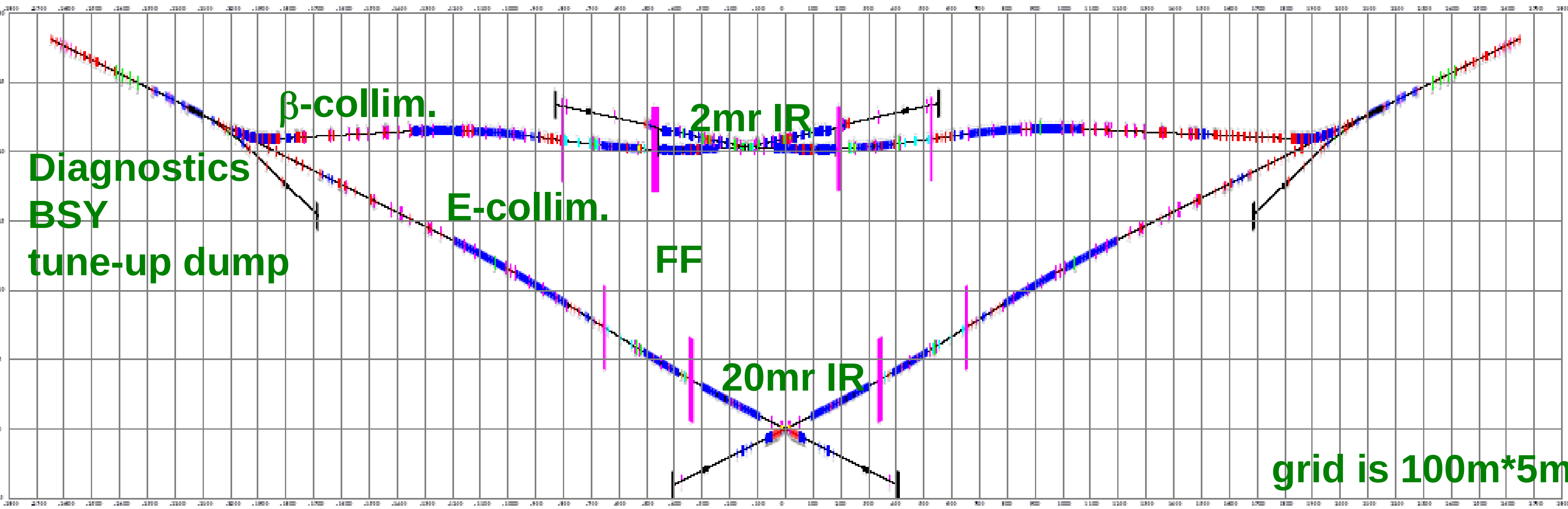
Cost Reduction

- Design Scope
- Component Costs
- Physics Scope

No big ticket items!

Just lots of ≤1% effects

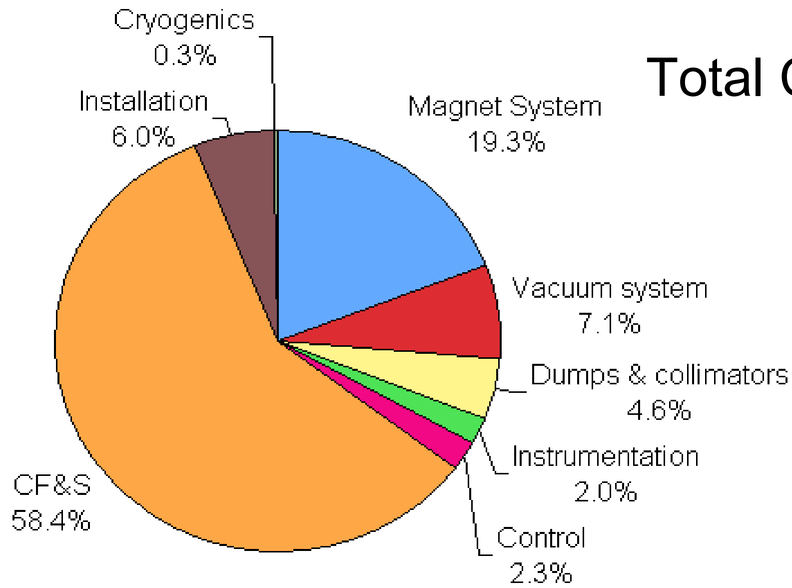
Vancouver Baseline

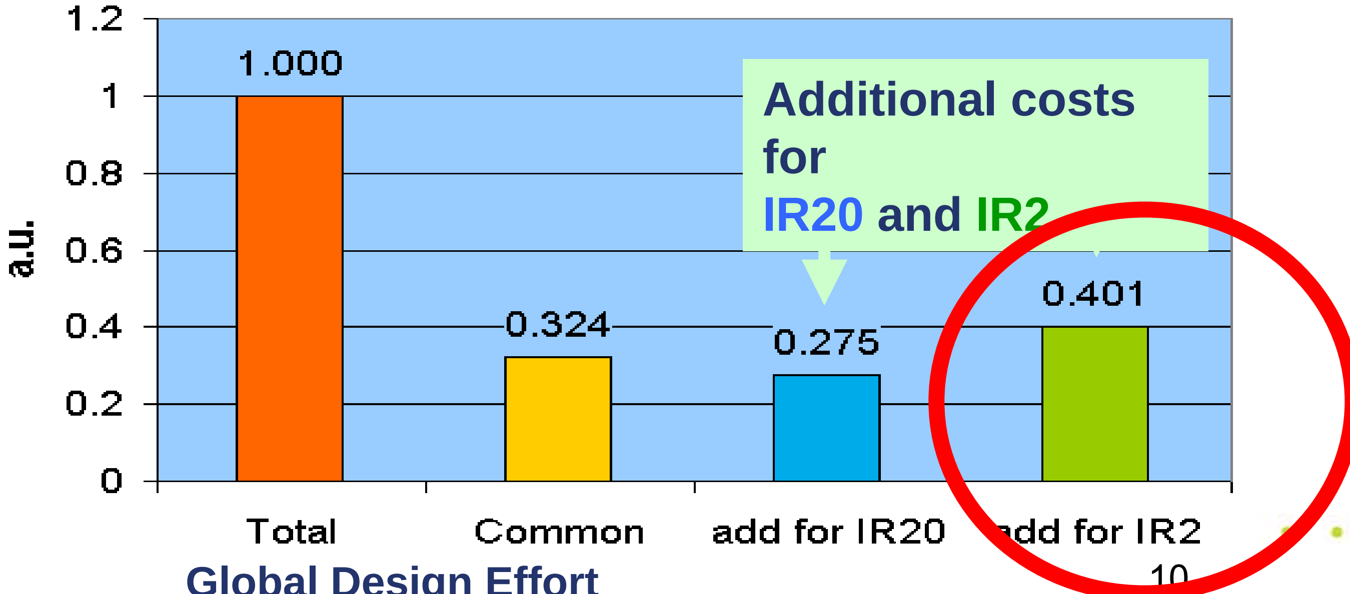


- **Two IRs with 20mrad and 2mrad crossing angle**
- **Two collider halls separated longitudinally by 138m**

Vancouver Costs for BDS

- Cost drivers
  - CF&S
  - Magnet system
  - Vacuum system
  - Installation
  - Dumps & Collimators

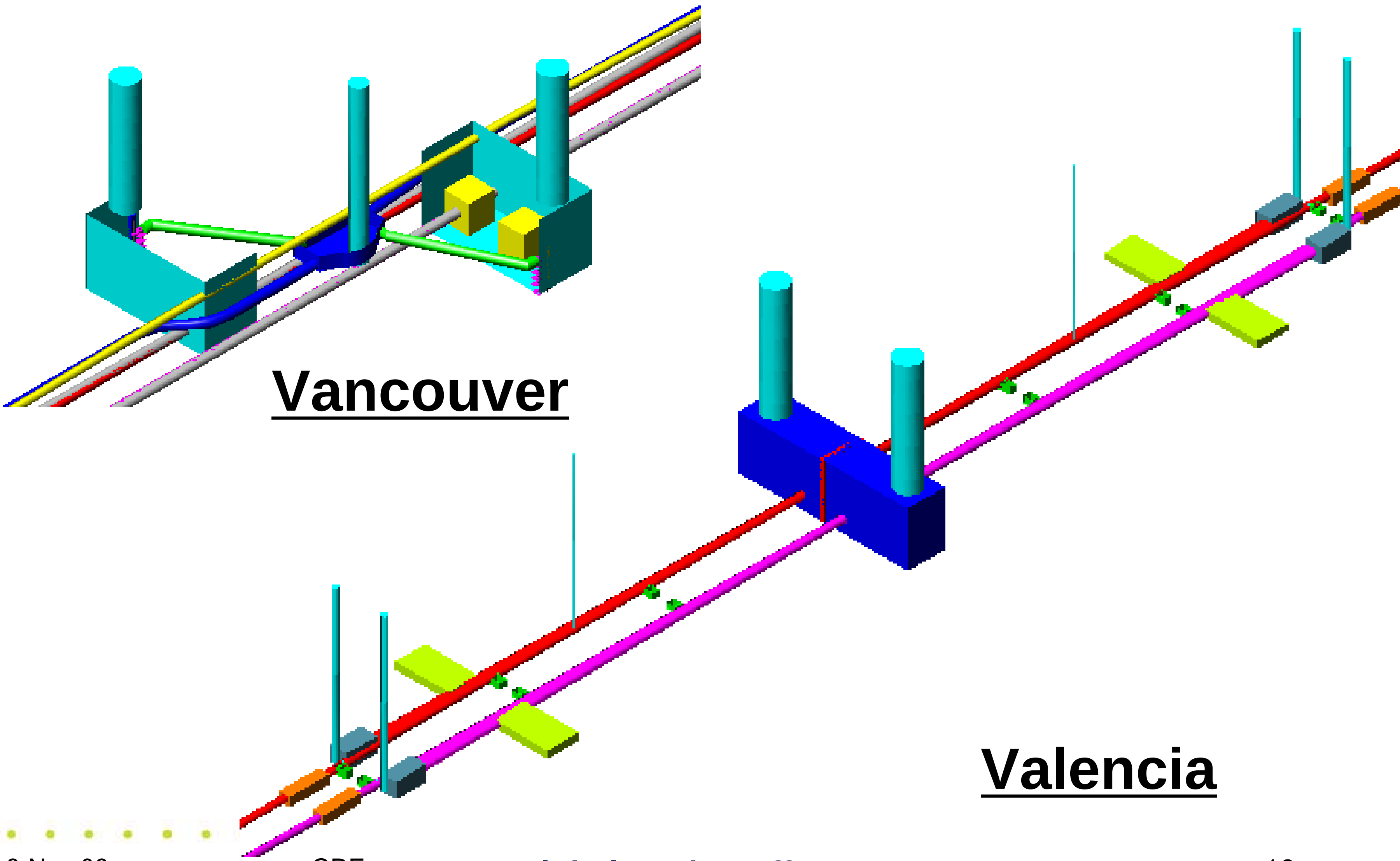




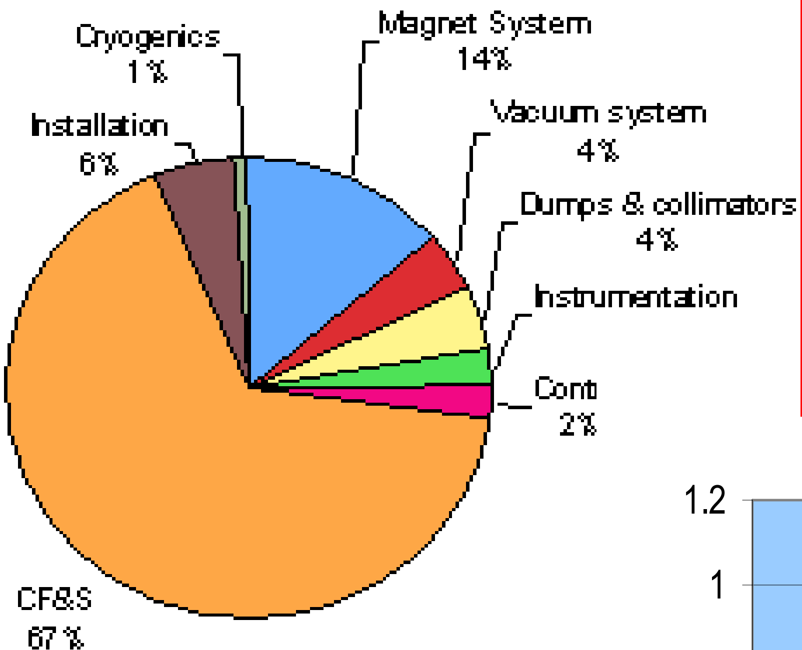
2/20 mrad → 14/14 mrad

- Motivation
  - **Reduce costs**
    - 2 mrad beam line expensive, risky, especially extraction line
    - Common collider hall
  - **Advantages**
    - Improved radiation conditions in the extraction lines
    - Better performance of downstream diagnostics
    - Easier design and operation of extraction optics and magnets
    - Reduced back scattering from extraction line elements
  - **Disadvantages**
    - Impact on physics (appears minor at present).
    - Simpler incoming beam optics
- R&D on small crossing angles will continue as alternative

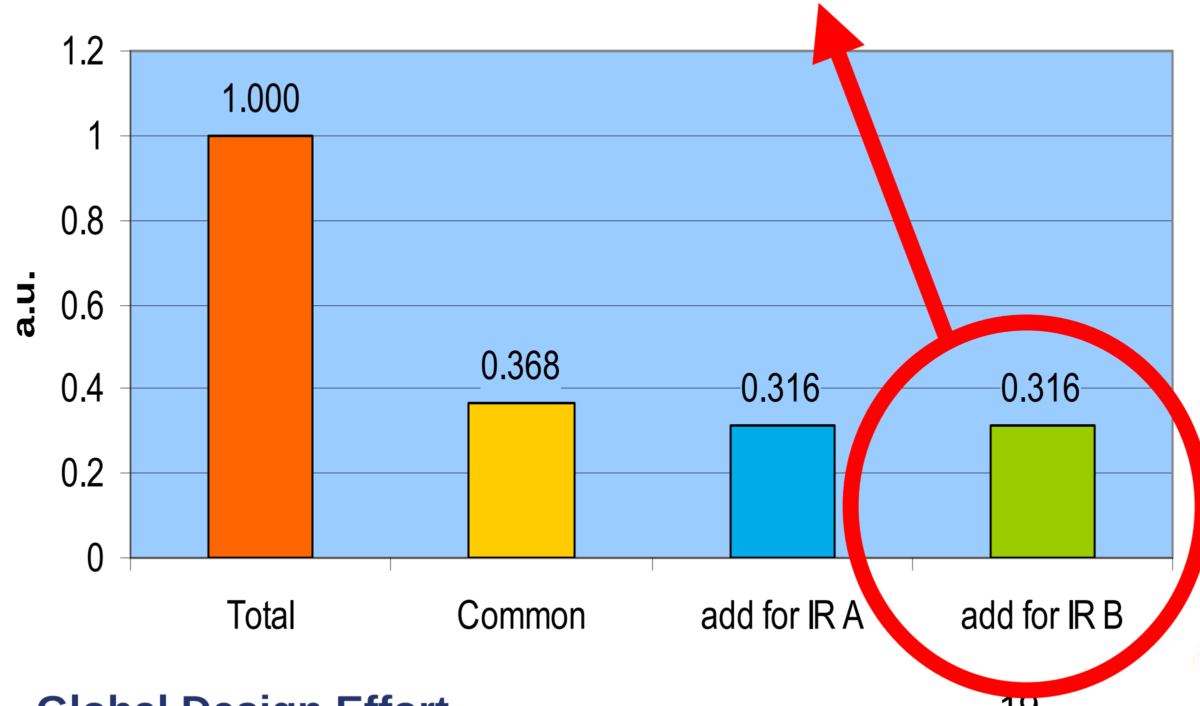
Hall Designs for two IRs



Cost details of new 14/14 baseline



Should we go to a single IR and push pull system and save 30% of BCD costs?



Updates from CF&S
Magnets to be included

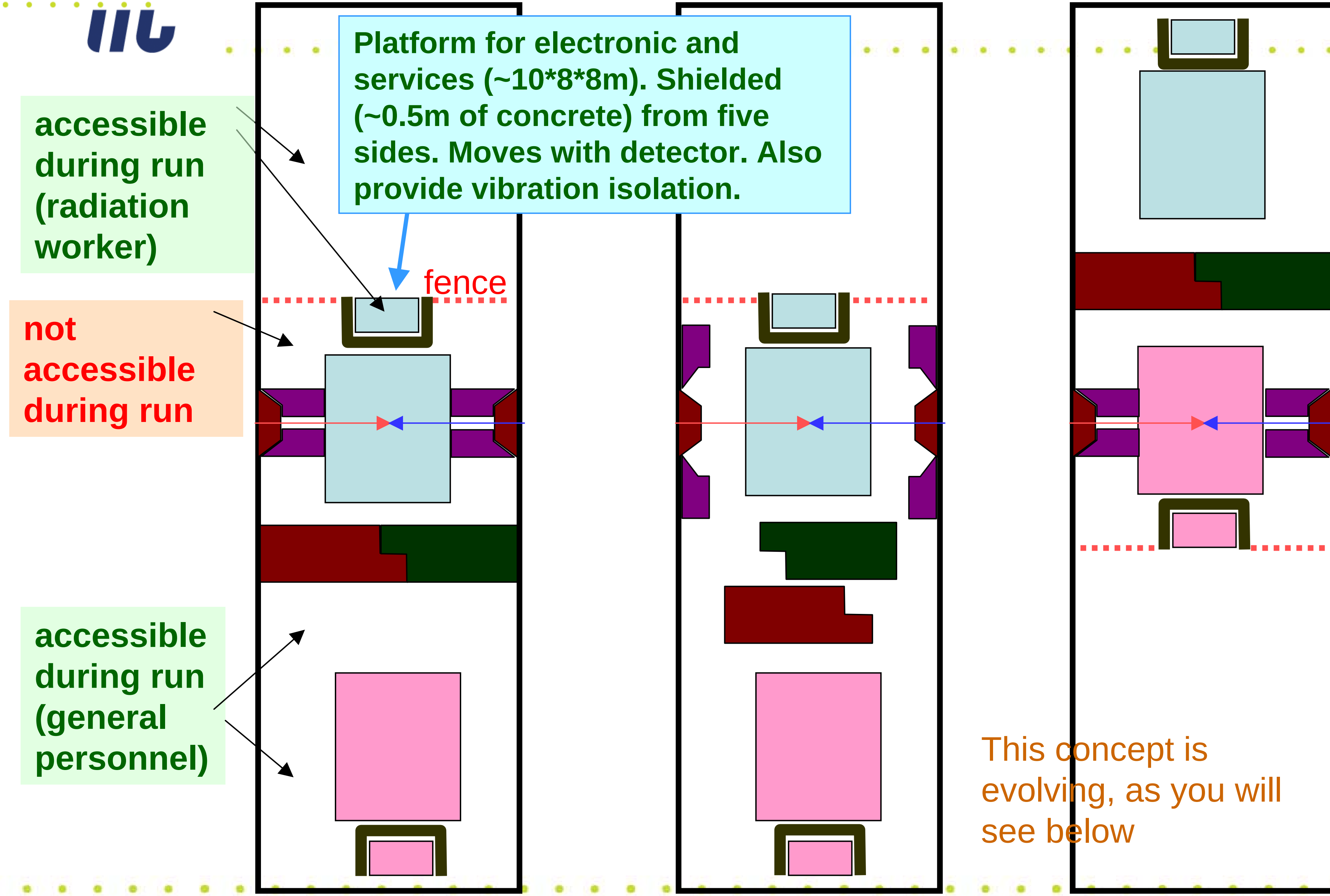
Would 1 IR lead to 1 Detector?

- NO! We have no intention of going to one detector.

- In my opinion, the case for two detectors is much stronger, if it does not require a second expensive beam line

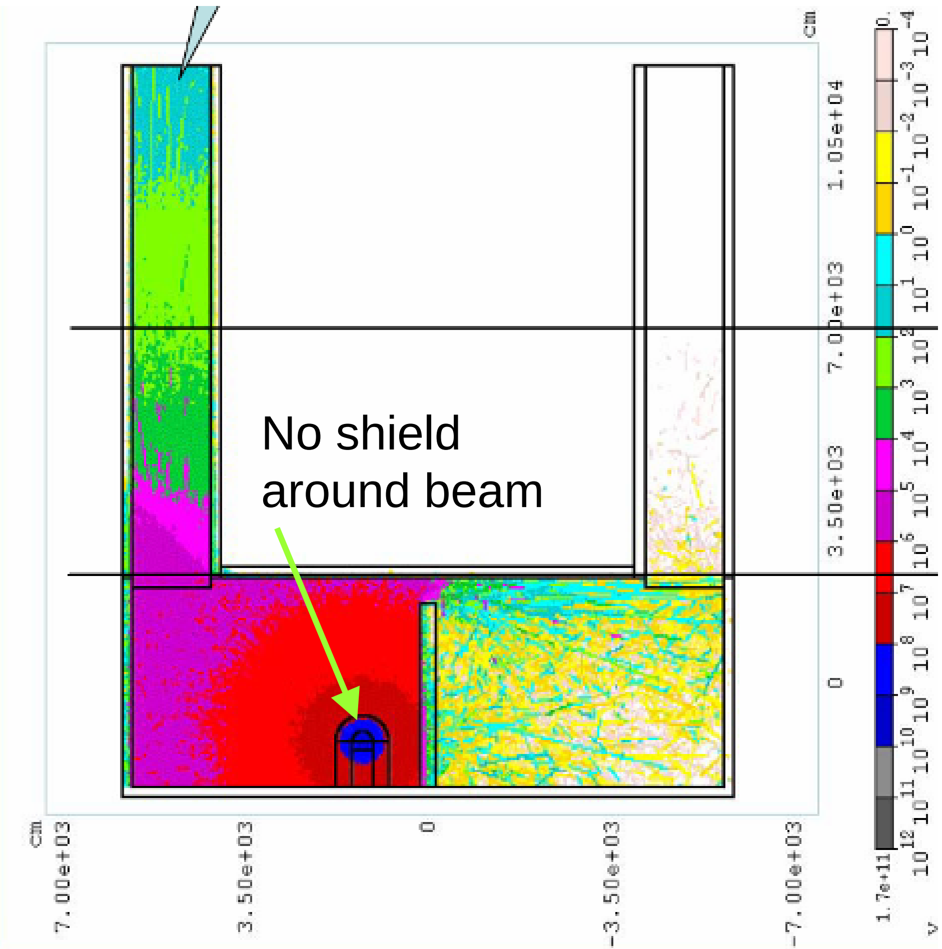
- However, it the burden on the detector community is to develop two **complementary** detectors.

Concept which does not rely on self-shielding detector

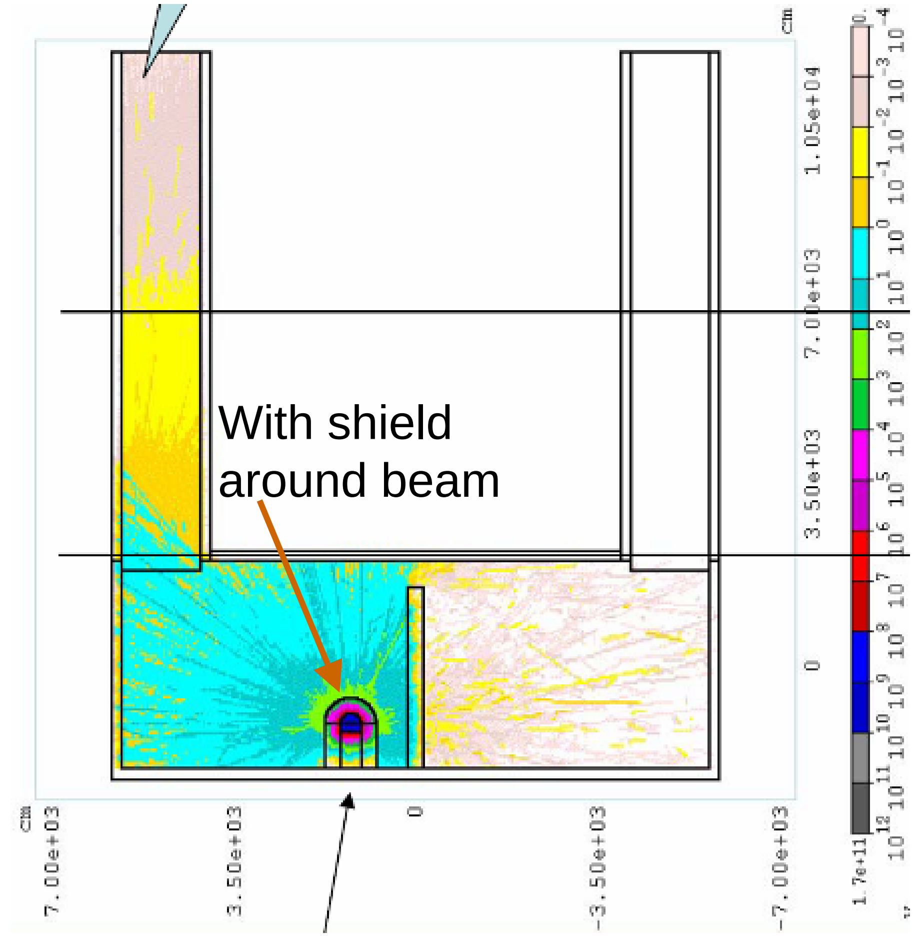


This concept is evolving, as you will see below

IR hall with shielding wall



May need additional curtain wall on top of main wall. May need shaft cover.



Do not need full height wall. The height could be decrease from what shown.

RP T.Sanami and A.Fasso

2006年9月19日

Air-pads at CMS

Single air-pad capacity ~385tons (for the first end-cap disk which weighs 1400 tons). Each of air-pads equipped with hydraulic jack for fine adjustment in height, also allowing exchange of air pad if needed. Lift is ~8mm for 385t units. Cracks in the floor should be avoided, to prevent damage of the floor by compressed air (up to 50bars) – use steel plates (4cm thick). Inclination of ~1% of LHC hall floor is not a problem. Last 10cm of motion in CMS is performed on grease pads to avoid any vertical movements. [Alain Herve, et al.]

Photo from the talk by Y.Sugimoto, http://ilcphys.kek.jp/meeting/lcdds/archives/2006-10-03/

14kton ILC detector would require ~36 such air-pads

Luminosity sharing & efficiency

- Assumptions in the two IR baseline:
  - **machine is designed to allow switch between detectors on the timescale of weeks-months**
  - **estimated switch-over time, for realignment of BDS beamlines and their retuning, is 3-4 days**
    - the pulse-to-pulse switch-over, which is sometime mentioned, is not supported by hardware of present ILC baseline
- Considerations for single IR
  - **it may be argued that recovery of full luminosity in a BDS that was OFF only for a day, should be rapid**

Schedule considerations

- Consider design goal for subsystems 0.5-1 day for detector exchange operation
- Depending on the mode of operation, the desired frequency and duration of exchange may vary
  - **in precision scan, longer intervals and switch-over may be fine**
  - **in discovery mode, rapid exchanges are more essential**
- Switching over in ~3 days (to full luminosity) would also be sufficiently fast
- Further detailed study, including cost optimization, would clarify where in the range of ~0.5-3 days the design goal should be placed

Seryi (Joint BDIR/GDE/WWS/MDI)

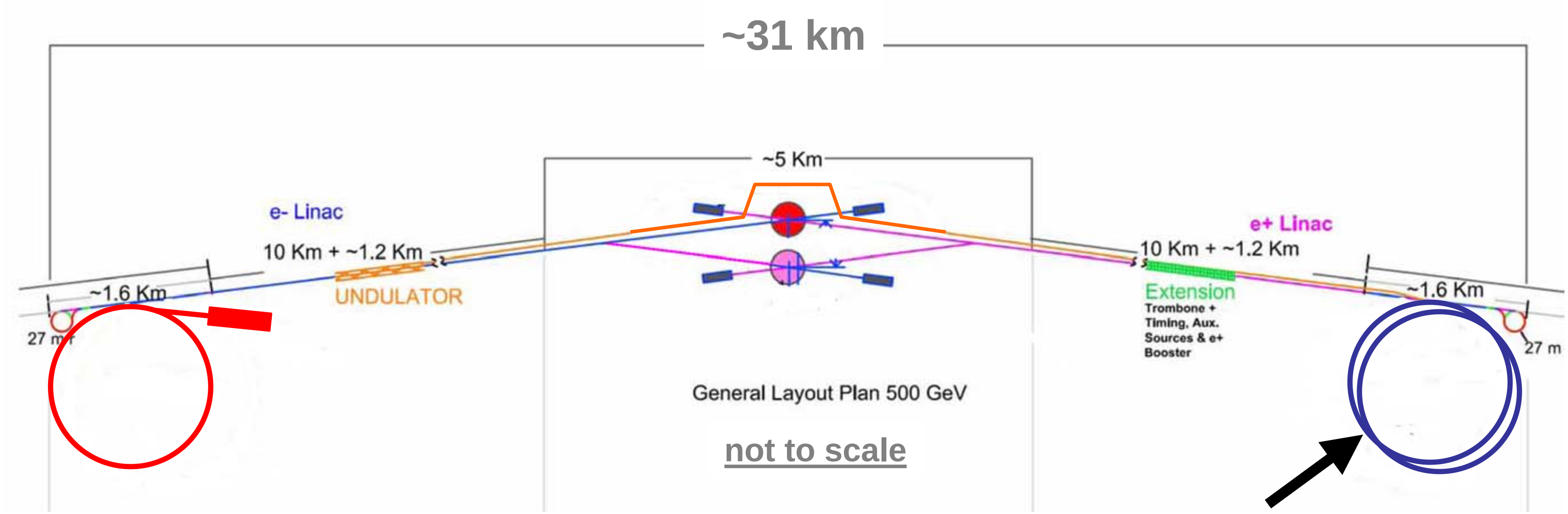
Summary

- At the end of September 2006, technical evaluation of push-pull option started by an extended task force, which included detector and accelerator experts in ILC community and beyond. More than 60 people were involved.
- Many technical questions have tentative answers
- Detailed studies and engineering design are needed, which surely could not be done in such short time scale
- Fundamentally, the push-pull option should be feasible, provided careful design and sufficient R&D resources

Sep 21-Nov 2, 06 Global Design Effort push-pull: 57

Damping Ring

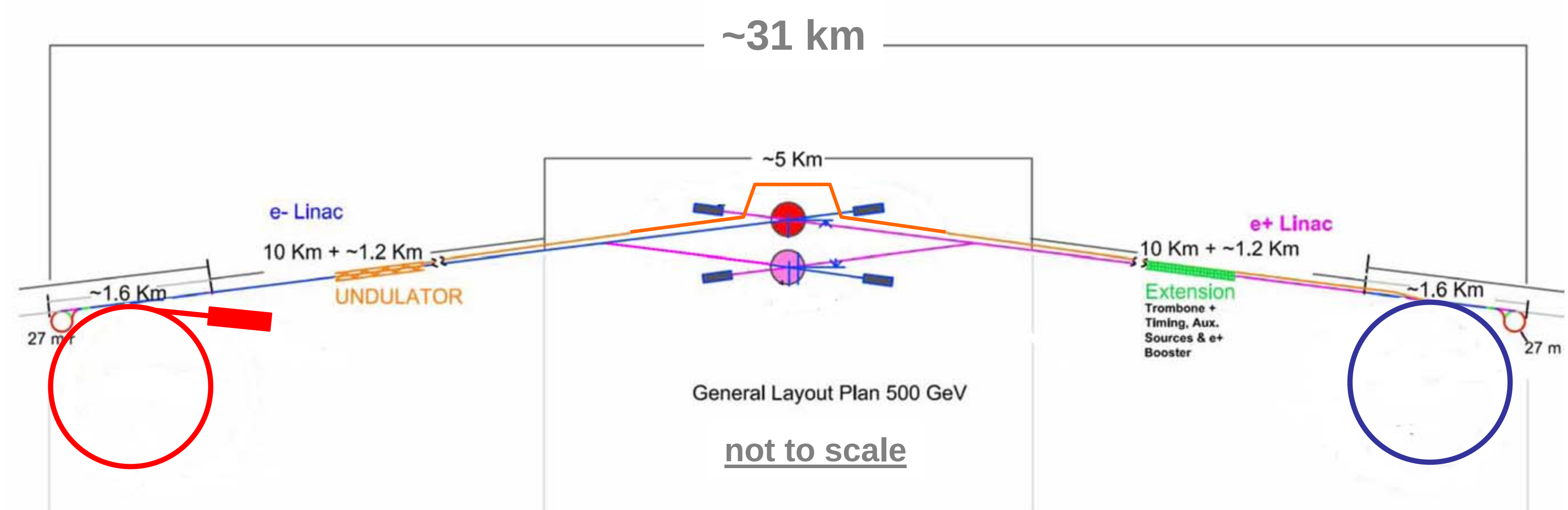
Baseline Configuration



Removal of second e+ ring

Damping Ring

Baseline Configuration

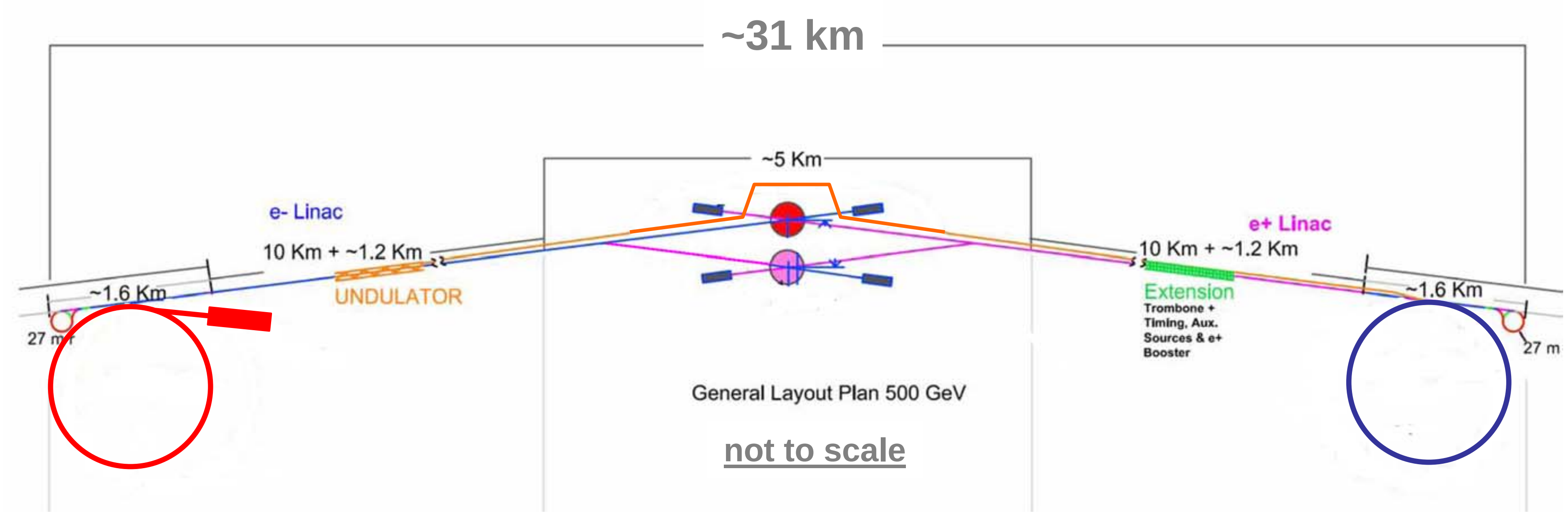


Removal of second e+ ring

simulations of effect of clearing electrodes on **Electron Cloud** instability suggests that a **single e+ ring** will be sufficient

Damping Ring

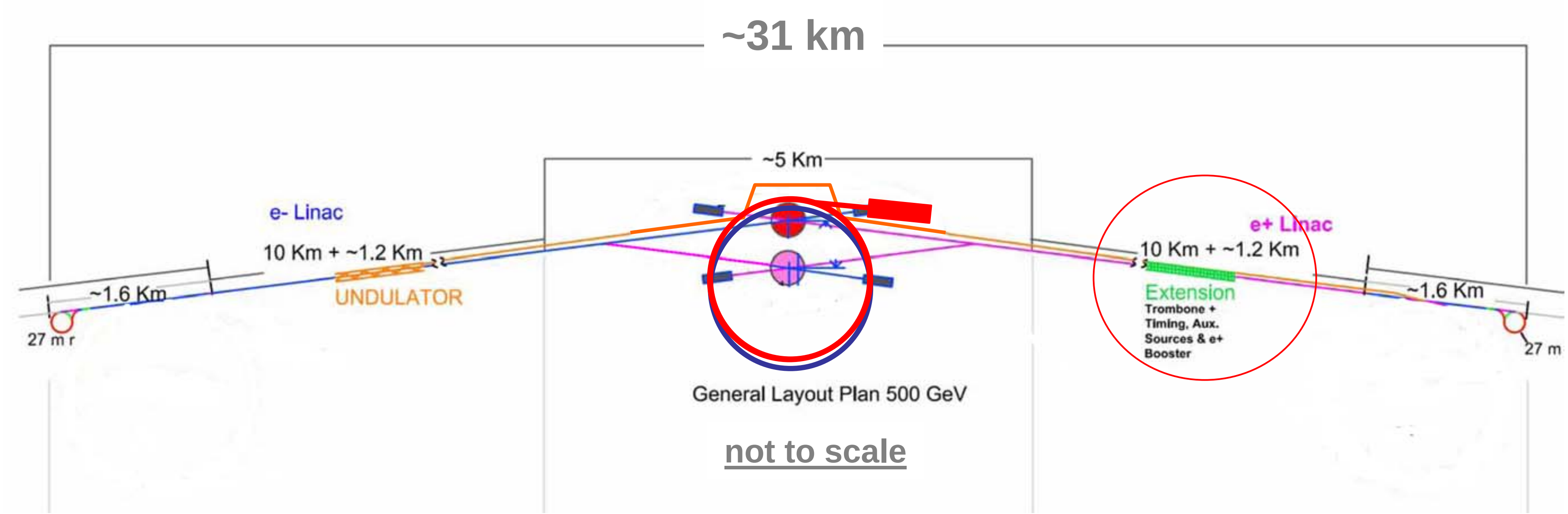
Baseline Configuration



Centralised injectors

Place both e+ and e- ring in single centralized tunnel

Baseline Configuration



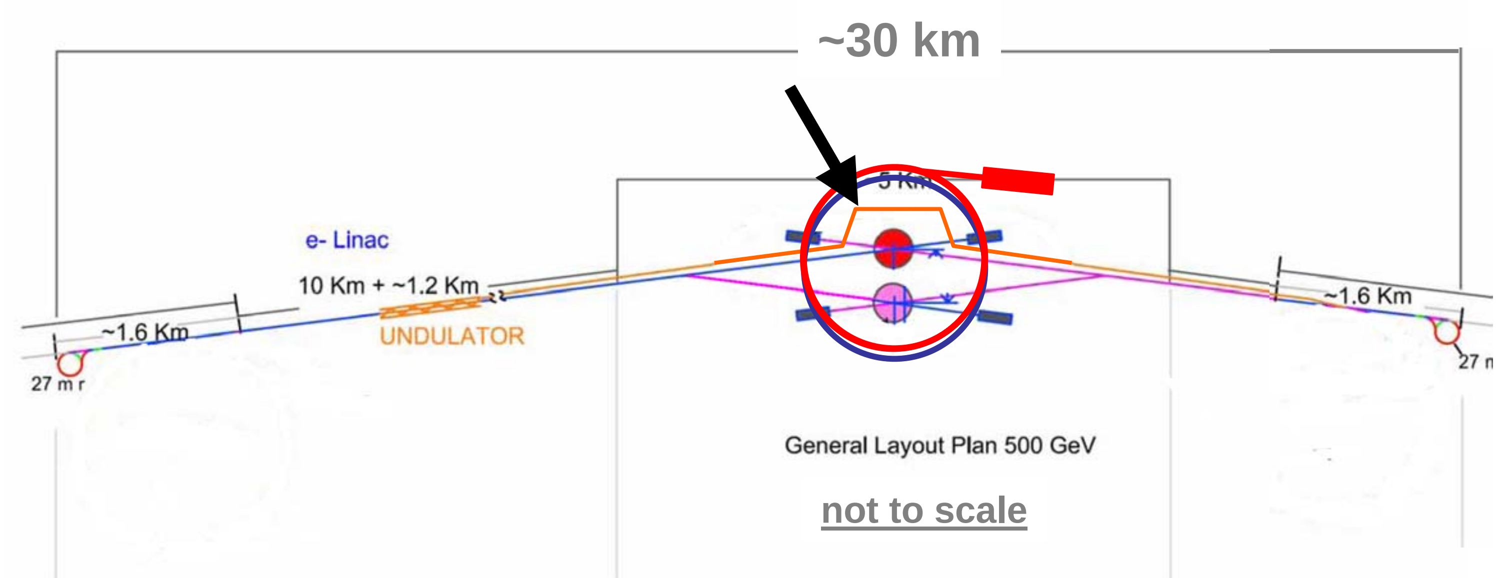
Centralised injectors

Place both e+ and e- ring in single centralized tunnel

Adjust timing (remove timing insert in e+ linac)

Damping Ring

Baseline Configuration



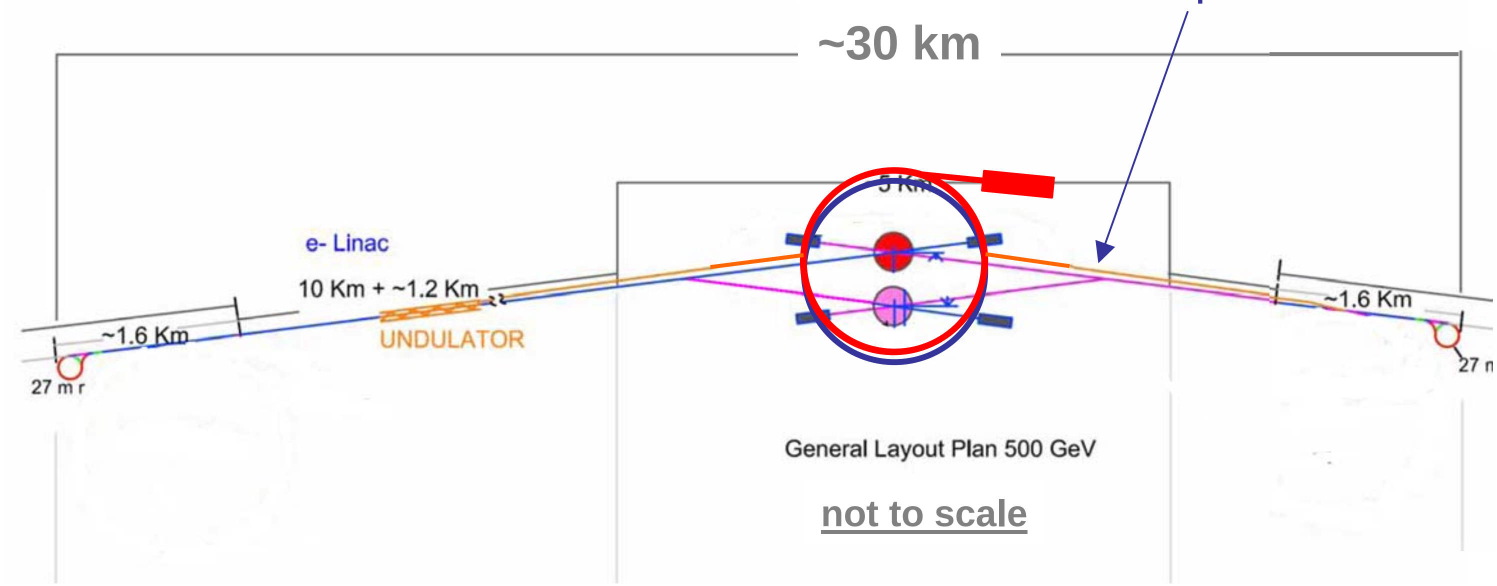
Centralised injectors

- Place both e+ and e- ring in single centralized tunnel
- Adjust timing (remove timing insert in e+ linac)
- Remove BDS e+ bypass

Damping Ring

Baseline Configuration

Long 5GeV low-emittance transport lines now required



Centralised injectors

Place both e+ and e- ring in single centralized tunnel

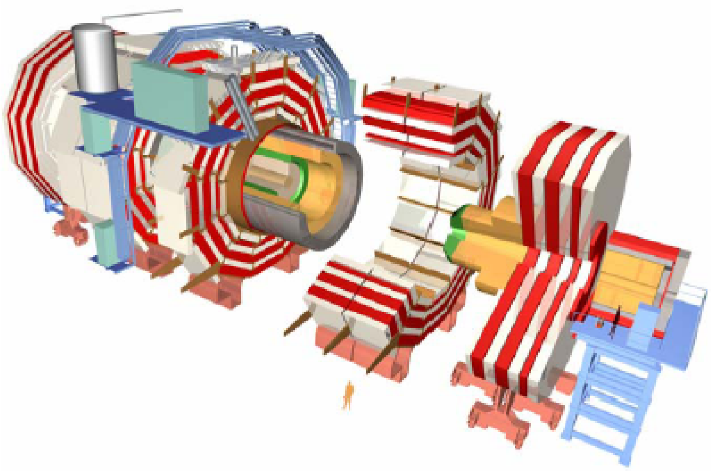
Adjust timing (remove timing insert in e+ linac)

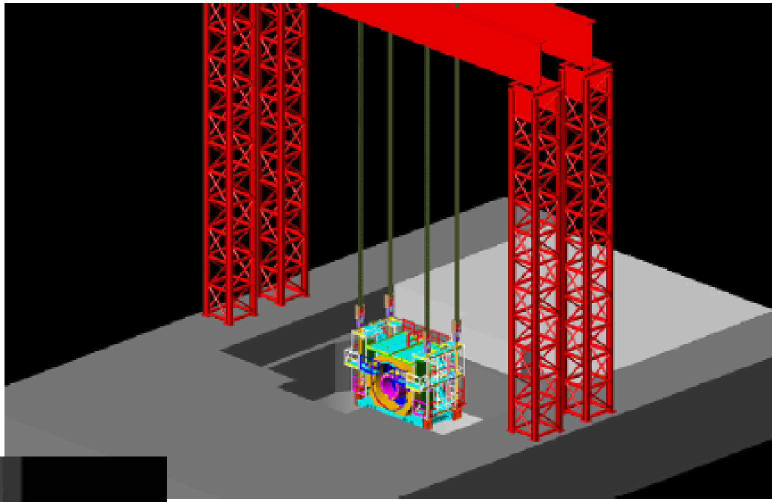
Remove BDS e+ bypass

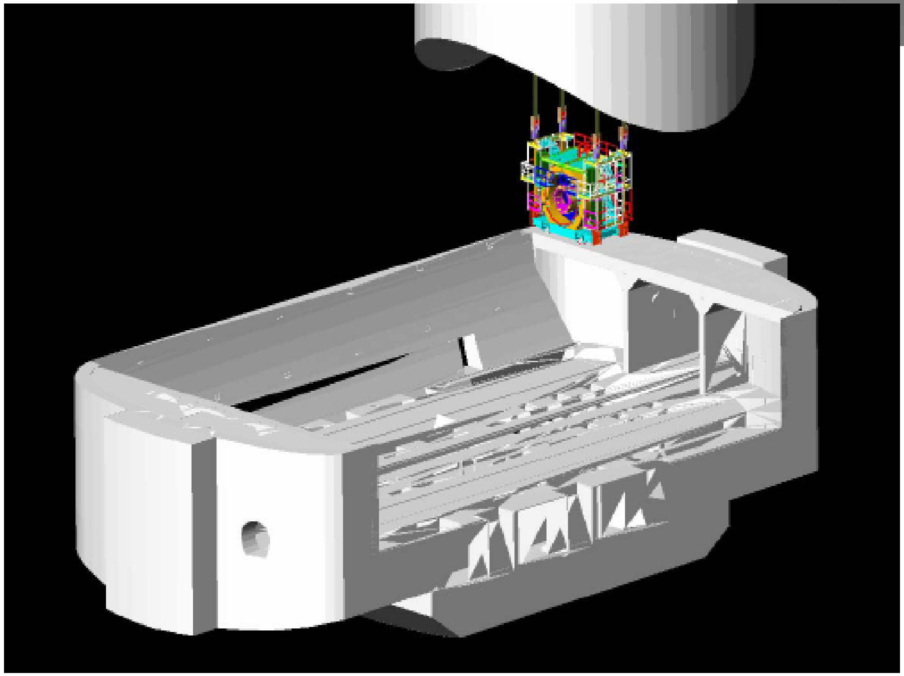
On-surface Detector Assembly

- Vancouver WBS considered the underground halls sized at 32m (W) x 72m (L) each to allow underground assembly of the largest considered detector.
- Conventional Facilities Schedule gives detector hall is ready for detector assembly 5 yrs from project start
  - **If so, cannot fit our goal of "7years until first beam" and "8years until physics run"**
- Surface assembly allows to save 2-2.5 years and allows to fit into this goal
  - **The collider hall size may be smaller (~40-50%) in this case**
  - **A building on surface is needed, but savings may be still substantial**
- Optimization needs to be done

On-surface assembly





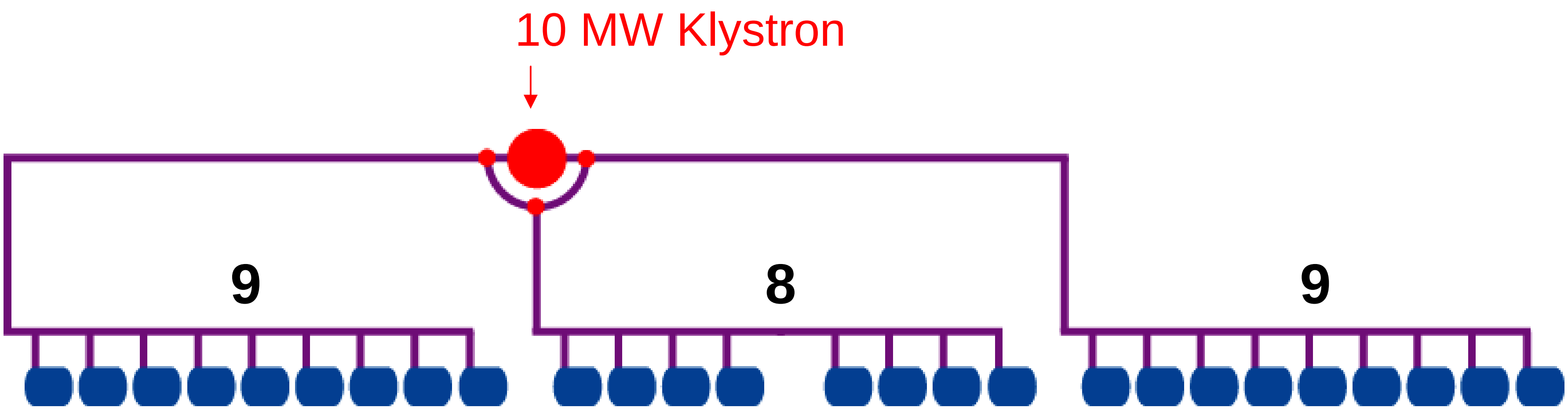


CMS assembly approach

- **Assembled on the surface in parallel with underground work**
- **Allows pre-commissioning before lowering**
- **Lowering using dedicated heavy lifting equipment**
- **Potential for big time saving**
- **Reduce size of underground hall required**

RF Distribution Math

(for 33.5 MV/m Max Operation)



33.5 MV/m * 9.5 mA * 1.038 m = 330.3 kW (Cavity Input Power)

× 26 Cavities

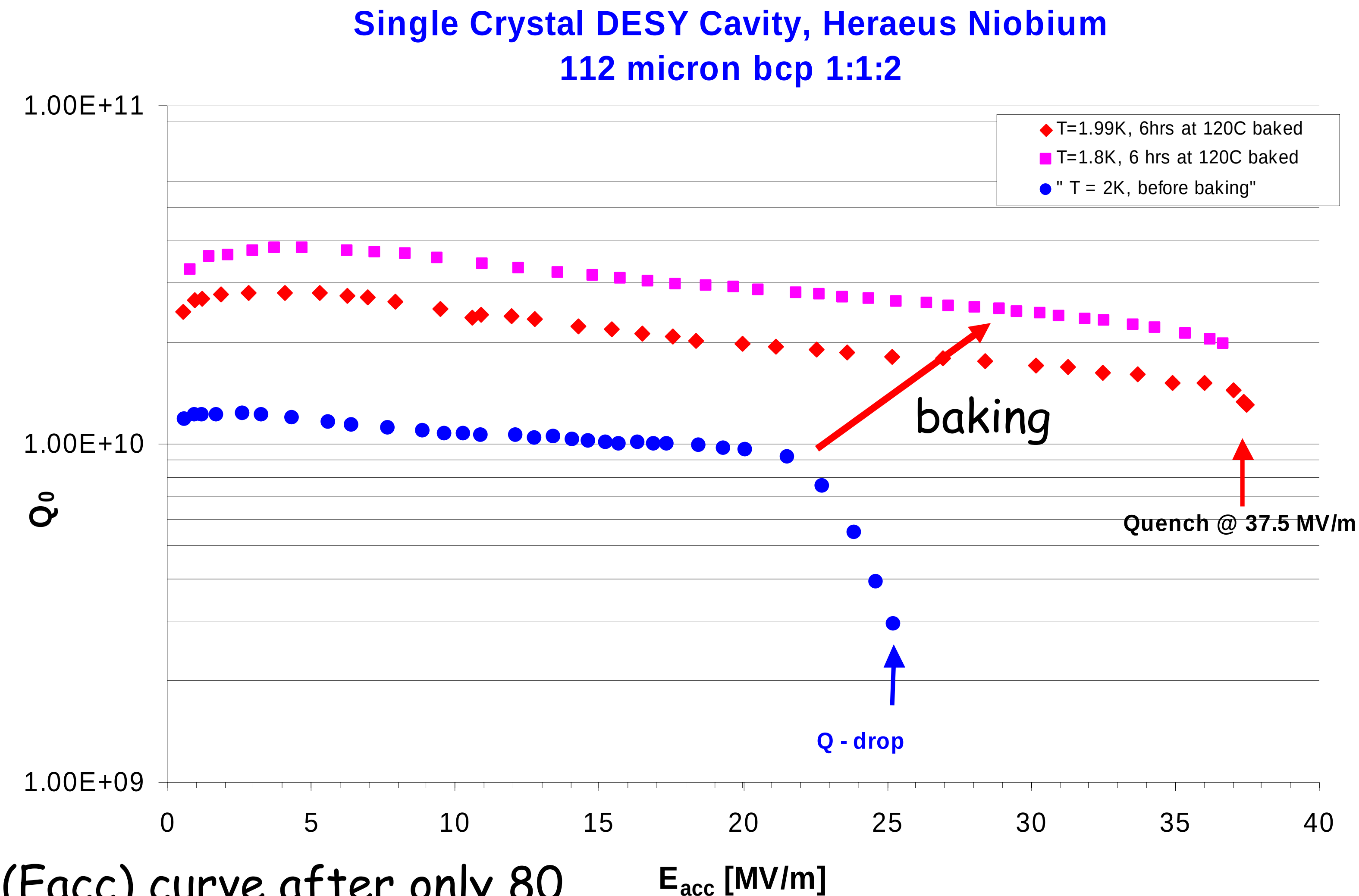
× 1 / 0.95 (Distribution Losses)

× 1 / 0.90 (Tuning Overhead)

= 10.0 MW

(for 31.5MV/m, transferred power to beam is 8.0MW.)

Single Crystal Cavity - Result



Q(Eacc) curve after only 80 μm BCP and in situ baking 120°C for 12 hrs.

Examples of Cost-Driven Design Modifications being considered

	RDR MB	CCB
2×14mr IRs	supported	✓
central injectors	supported	✓
Removal of service tunnel	**rejected**	
conventional e+ source	**rejected**	
RF unit modifications (24 → 26 cav/klys)	supported	submitted
reduced RF in DR (6 → 9mm σ_z)	supported	in prep
DR race-track lattice (CFS)	supported	in prep
reduced static cryo overhead	supported	in prep
removal linac RF overhead	supported	in prep
single-stage bunch compressor	**rejected**	
e- source: common pre-accelerator	supported	in prep

ICFA International Committee

ILC parameters revisited

The ILCSC sub-group on parameters is asked to

Revisit the Baseline Machine performance and Energy Upgrade parameters it had established two years ago, taking into account possible new insights and developments

Discuss, together with the GDE_and WWS, all areas of the RDR design optimisation affecting the performance parameters

Revisit the Options Beyond the Baseline Machine it had established two years ago, and provide clear cost versus performance guidance as its effects the initial machine configuration

Make report (and interim report if necessary) well in phase of the development of RDR

Members of the 'parameter group' : R.-D. Heuer (chair), S. Komamiya, D. Son, P.Grannis, M.Oreglia, F.Richard, International Committee

Questions to Working Groups

- At what amount of integrated luminosity are systematic effects becoming dominant?
- Is there any impact of decreasing (increasing) beamstrahlung by a factor of two relative to the standard parameters, i.e. trading off luminosity vs background?
- Is there any benefit from electron plus positron polarisation (80 and 60%) or from increased electron polarisation in the absence of positron polarisation?
- Are there other accelerator parameters strongly influencing the measurement?

Plus special questions to each WG

Group presented preliminary conclusions ->

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Energy

Highest possible energy is called for but at present there is no known measurement which could not be done at slightly reduced energy.

Removing safety margins in energy reach is acceptable.
Max. lumi not needed at the top energy (500 GeV)

However, 500 GeV should be reachable assuming nominal gradient before knowing more about physics scenarios which are realised

Upgrade to 1 TeV must be included in planning, design and implementation

Luminosity

All measurements are statistically limited,

Lowering luminosity by a factor 2 results in doubling the running time.
Interested in **integrated luminosity:**

Reducing luminosity should be the very last option.
Staging in the first few years possible and to be discussed.
No permanent de-scoping.

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Beamstrahlung

Most measurements suffer from increased beamstrahlung thus requiring more luminosity for achieving same accuracy

On the other hand reduced beamstrahlung results in luminosity gain

Reduced beamstrahlung equivalent to some luminosity gain dependent on physics channel (e.g. M_H at E=350 GeV)

Consequence:
→ with reduced beamstrahlung slightly lower current acceptable

Higher beamstrahlung undesirable (to be quantified)

Positron Polarisation

Many measurements gain from positron polarisation, thus also requiring less luminosity for same accuracy.

Positron Polarisation is very beneficial in many scenarios, including SM scenarios
→ this option mandatory to be kept open

Note: Recently the possibility of initial positron polarisation as high as 30% was
mentioned for the ILC baseline configuration (eq. to 10% lumi gain?)
Assuming this, a slight reduction in luminosity seems acceptable
→ to be verified and quantified by the physics groups

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Nr of IRs

Two experiments are required.

If large cost saving with one IR: Push-Pull could be an option.
However:

- reasonably short time to switch over (1week or so?) in order not to loose much lumi
- frequent moves desired (every 2-3 months?) in a predefined rhythm, in order to treat both exp‘ts equally

-> short transfer times and frequent change are a must

Two detectors <u>highly desired</u>, one IR feasible
→ See report by the push-pull task force

Options

Gamma-Gamma

Should be kept as an option for the reasons given in the 2003 document.

However:

more realistic studies plus possibly investments are required.

Giga-Z

to be kept as an option for the reasons given in the 2003 document

My Conclusion re Parameters

- Clear message from Parameter Group:

- No irreversible de-scoping
- Keep an eye on energy up-grade

ICFA International Committee

Recent Strategy Recommendations

- EPP2010
  - Revealing the Hidden Nature of Space and Time: Charting the Course for Elementary Particle Physics

  -> leading to P5 recommendation

- CERN Council Strategy Group
  - Unanimous approval of European strategy

Both strongly support the full exploitation of LHC and give strong support to the International Linear Collider

- US plans

P5 Report: The Particle Physics Roadmap October 2006

http://www.science.doe.gov/hep/P5RoadmapfinalOctober2006.pdf

- 'The ILC is the highest priority future project in the recent EPP2010 report from the National Research Council. We allocate $500 million for the relevant R&D activities over a five-year period. The goal is to produce a technical design on an international basis and once initial LHC physics results are known to initiate the next step toward realization of this accelerator'

P5 Roadmap - 2006, US Program

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Additional Progress

- Japan

  -> ILC identified as highest priority for particle physics
- Europe: Strategy Forum on Research Infrastructure

  -> Road map contains ILC (implications for funding, e.g. SCRF test facility)
- American Physical Society Council

  -> Resolution

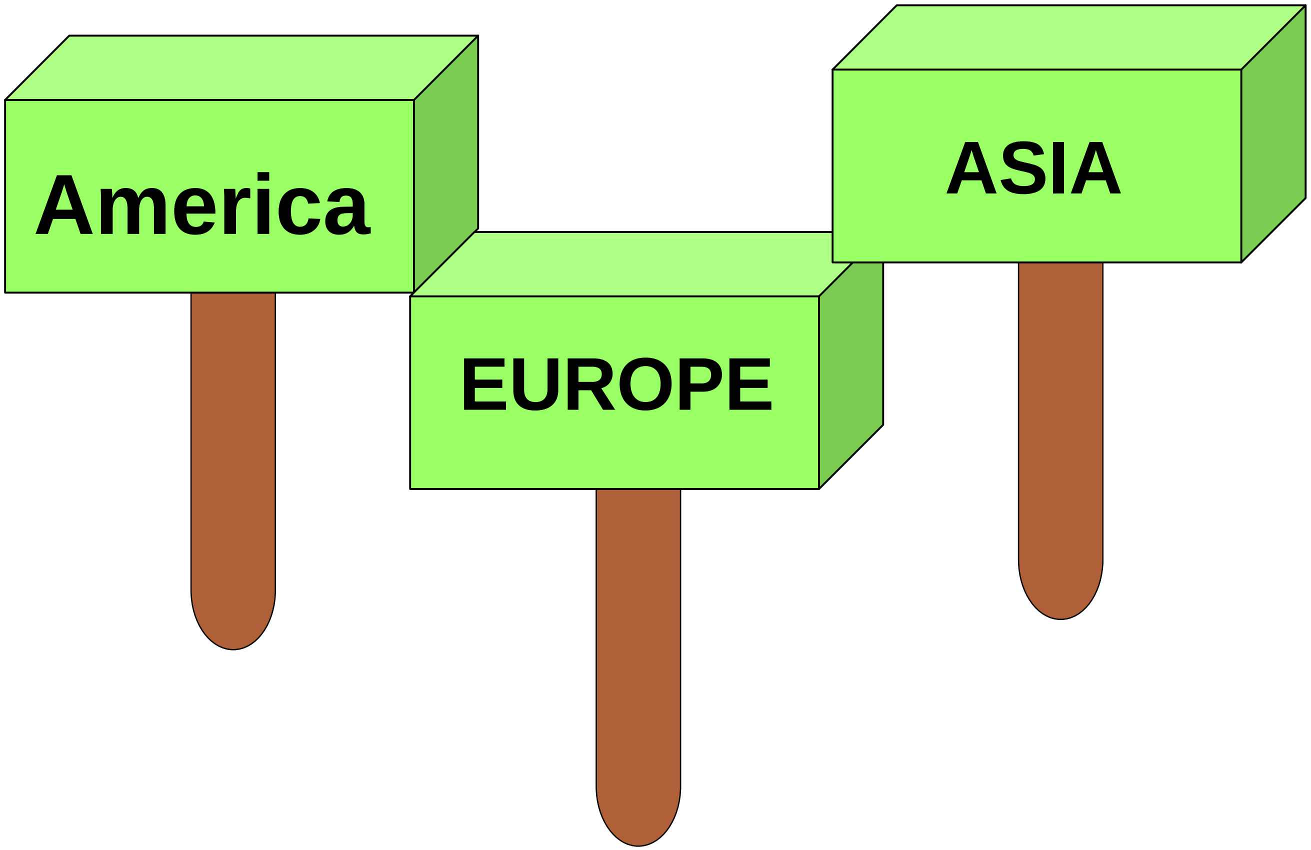
APS Statement

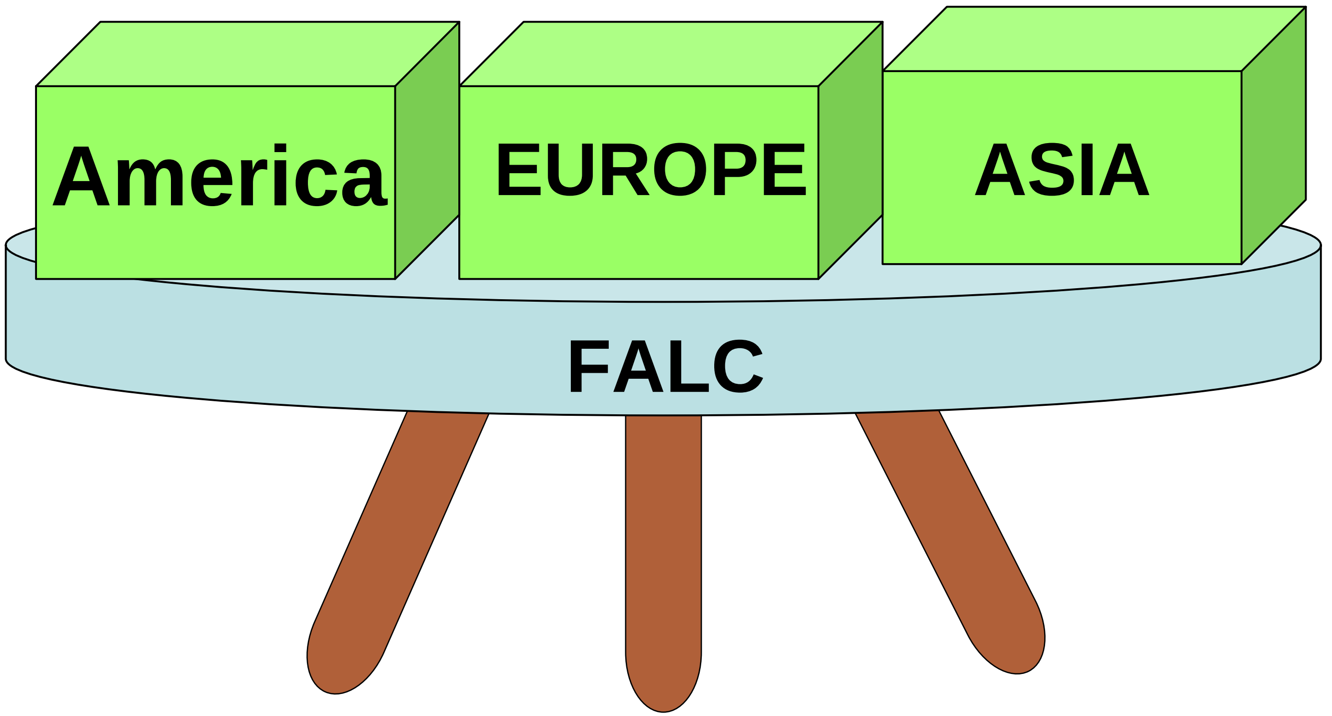
- EPP2010: “The United States should remain globally competitive in elementary particle physics by playing a leading role in the worldwide effort to aggressively study Terascale physics.”
- To achieve that end in the context of successful international collaborations on large scientific facilities, the American Physical Society, consistent with the recommendations in *EPP-2010*:
- Urges the Administration, acting through the Department of Energy and the National Science Foundation; and Congress, acting through the authorization and appropriations committees, to provide the American share of the “risk capital” for research and development (recommended in the National Academy report) leading to an engineering design and cost basis for the International Linear Collider project; and
- Further urges the Administration and Congress, to offer to site such a project in the United States, if the outcome of the research and development effort is satisfactory.

FALC

- FALC = Funding Agencies for a Linear Collider
- Informal group of particle physics funding agencies from several countries
- Subgroup: FALC Resources Group (FALC-RG)
- Good coordination essential between FALC and ICFA
- Links between FALC, ICFA and ILCSC through their respective chairs

Regional policies /priorities




America
EUROPE
ASIA
FALC

Global context for particle physics

- Current projects – LHC
- R&D for the future – linear collider / neutrino facilities / LHC upgrades / CLIC
- How do we put these together in a new global strategy to maximise opportunities

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FALC Remit

- FALC agreed that to make progress towards a construction decision for a linear collider, it was necessary to consider the wider picture of particle physics research, understanding the priorities and constraints in each region.
- It was agreed that the remit of the Group should be broadened to include global coordination of, and information exchange on, the R&D programmes for upgrades of LHC, the present (ILC) and future (CLIC) linear colliders and the worldwide neutrino programme (such as proton driver, superbeam and neutrino factory).
- The Group agreed that although the acronym FALC should not be changed, it should be taken in future to represent 'Funding Agencies for Large Colliders'.