



The Status of the International Linear Collider

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SiD Workshop
Cosener's House, 14/4/08





ILC Parameters

- E_{cm} adjustable from 200 – 500 GeV
- Luminosity $\int L dt = 500 \text{ fb}^{-1}$ in 4 years
(corresponds to $2 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$)
- Ability to scan between 200 and 500 GeV
- Energy stability and precision below 0.1%
- Electron polarization of at least 80%
- **The machine must be upgradeable to 1 TeV**



Global Design Effort Mission

- Produce a design for the ILC that includes a detailed design concept, performance assessments, reliable international costing, an industrialization plan, siting analysis, as well as detector concepts and scope.
- Coordinate worldwide prioritized proposal driven R & D efforts (to demonstrate and improve the performance, reduce the costs, attain the required reliability, etc.)
- B. Barish is GDE Director, assisted by 3 regional directors: BF (Europe); M. Nozaki (Asia); M. Harrison (Americas).



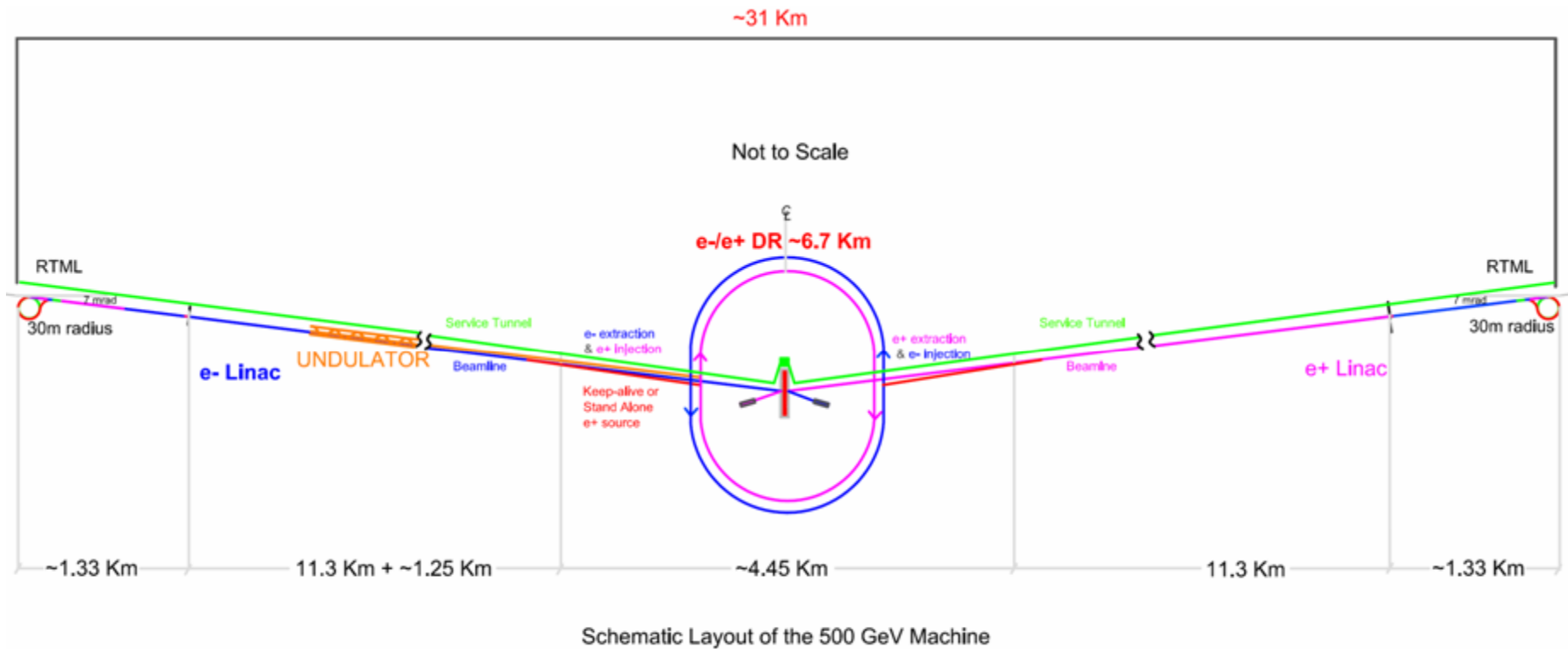
A New GDE

- Previous GDE was small and idiosyncratic. Some members were rather inactive; some very important high-profile jobs being done by non-members.
- GDE now reformed and reconstituted on basis of membership for all working more than 30% FTE - or with high-level responsibilities.
- New list exists - currently 480 GDE members worldwide.



Overall Layout @ RDR

1st Stage: 500 GeV; central DR et al. campus; 2 “push-pull” detectors in 14 mrad IR.



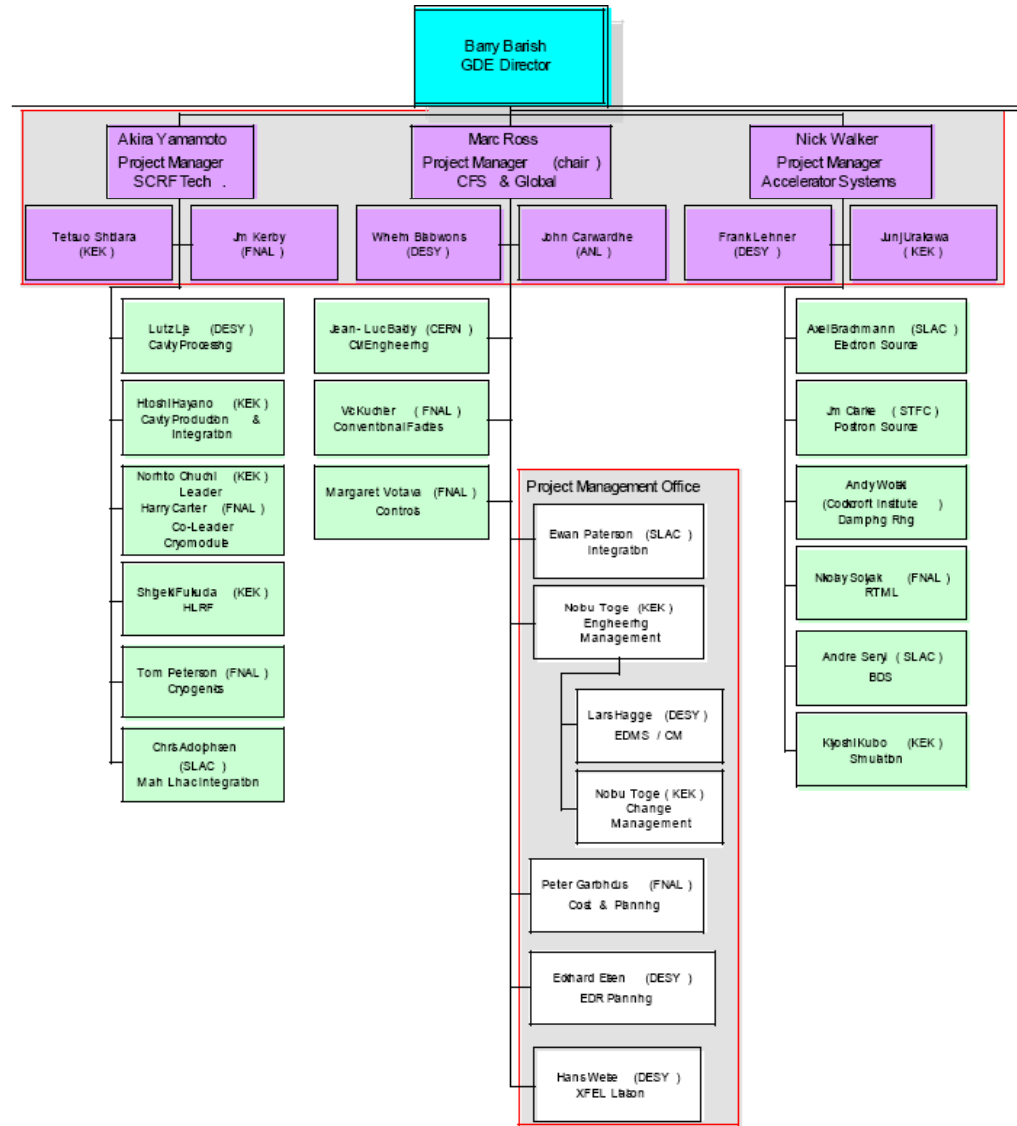


EDR phase

- The period between August and December 07 was one of intensive internal reorganisation and preparation for the EDR phase.
- Installation and staffing of the Project Management Office, led by PM 'Troika' :M.Ross (Fermilab) (Chair), N. Walker (DESY) & A. Yamamoto (KEK).
- All positions in project office filled.



EDR phase management structure





EDR phase - technical areas

- The R&D will be divided into 15 technical areas:

	Technical Area		
	1. Superconducting RF Technology	2. Conventional Facilities & Siting and Global Systems	3. Accelerator Systems
Technical Area Groups	1.1 Cavity Processing	2.1 Civil Engineering and Services	3.1 Electron Source
	1.2 Cavity Production and Integration	2.2 Conventional Facilities Process Management	3.2 Positron Source
	1.3 Cryomodules	2.3 Controls	3.3 Damping Ring
	1.4 Cryogenics		3.4 Ring To Main Linac
	1.5 High Level RF		3.5 Beam Delivery Systems
	1.6 Main Linac Integration		3.6 Simulations



“Black December”

- “Black December” saw STFC withdraw from ILC. In unrelated move, US cut funding in FY08 – in principle closing it down for remainder of FY.
- However, enough US money remained unspent to permit GDE Common Fund to be paid and the GDE organisation to remain in being.
- Nevertheless, this has been a major blow to the project.



FALC Meeting

- FALC met 17/18.1.2008 & confirmed that the physics motivation for a linear collider remains unchanged.
- The R&D underway in all three regions is fulfilling an important mission to establish the feasibility and technology necessary for the next large collider.
- FALC recognized that funding stability is the key to any international collaborative effort so none of the partners' investment is jeopardized.



ICFA/ILCSC Meeting

- ICFA Statement on Funding for the Linear Collider
- ICFA expresses its deepest concern about the recent decisions in the United Kingdom and the United States of America on spending for long-term international science projects.....



ICFA/ILCSC Meeting

- ...the sudden cuts implemented by two partner countries have devastating effects.
- ICFA feels an obligation to make policy makers aware of the need for stability in the support of major international science efforts.
- It is important for all governments to find ways to maintain the trust needed to move forward international scientific endeavours.



GDE response - the Technical Phase

- The last 3 months have been ones of turmoil and substantial rethinking.
- ALL of the major areas developed by the RDR were led by US or UK scientists.
- It can't be business as usual when such a large fraction of resources lost – 40 FTEs in UK – round £4M/year from UK - \$60M -> \$15M in US.
- New plan for TP phase concentrates and reduces work and lengthens timesales.



GDE response - the Technical Phase

- Particular concentration in early phase of TP is on cost reduction. Task forces at Sendai met for two days looking at very many ideas – some crazy, some obvious – as to how to reduce the cost of the RDR machine significantly.
- Will continue to be a priority at future meetings.

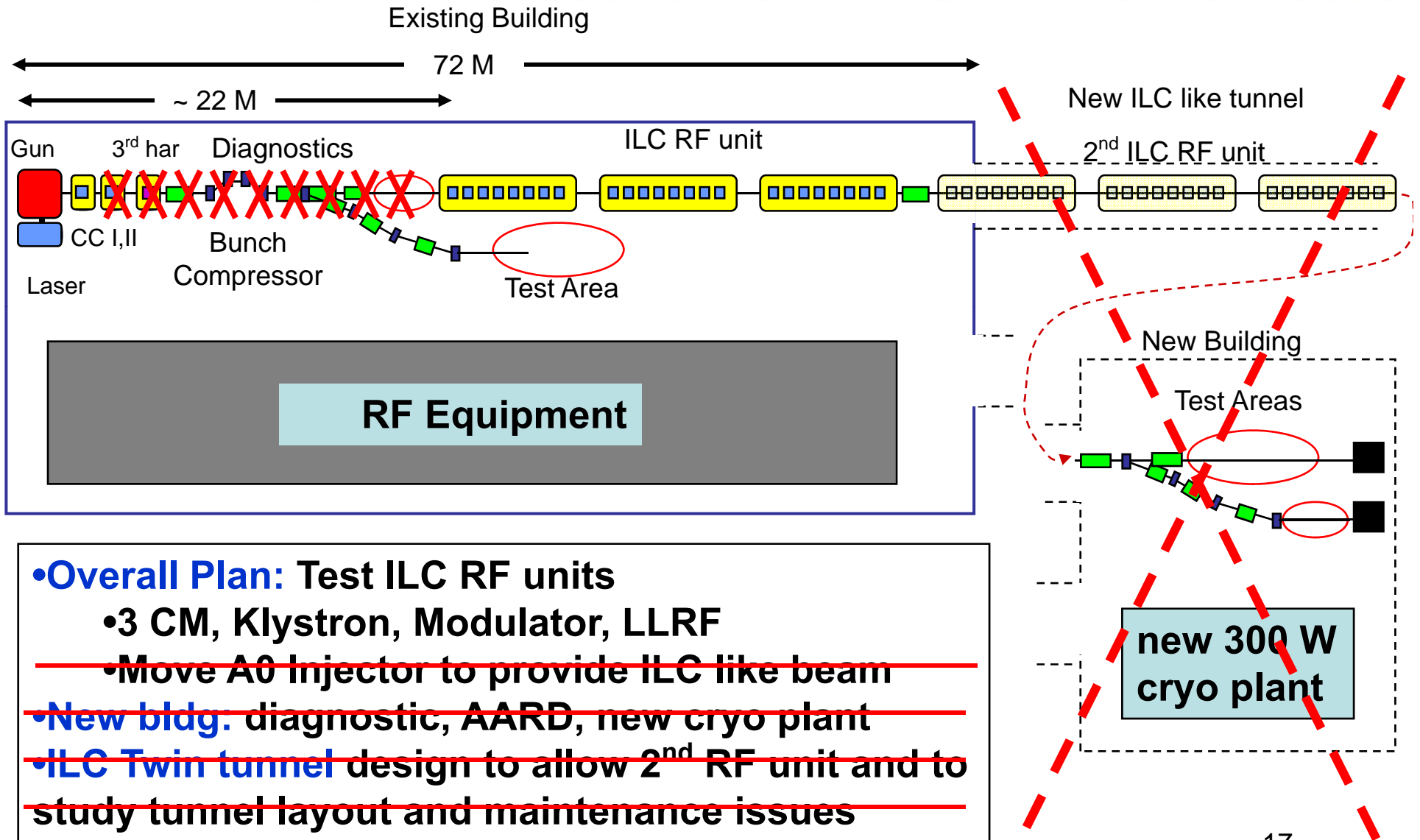


TDP R&D - SCRF

Calendar Year		2008	2009	2010	2011	2012
EDR	TDP1				TDP-II	
S0: Cavity Gradient (MV/m)	30	35 (> 50%)			35 (> 90%)	
KEK-STF-0.5a: 1 Tesla-like/LL						
KEK-STF1: 4 cavities						
S1-Global (AS-US-EU) 1 CM (4+2+2 cavities)			CM (4 _{AS} +2 _{US} +2 _{EU}) <31.5 MV/m>			
S1(2) -ILC-NML-Fermilab CM1- 4 with beam			CM2	CM3	CM4	
S2:STF2/KEK: 1 RF-unit with beam			Fabrication in industries		STF2 (3 CMs) Assemble & test	

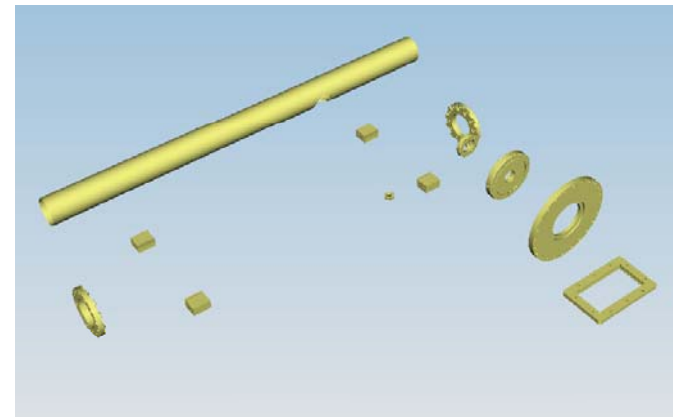
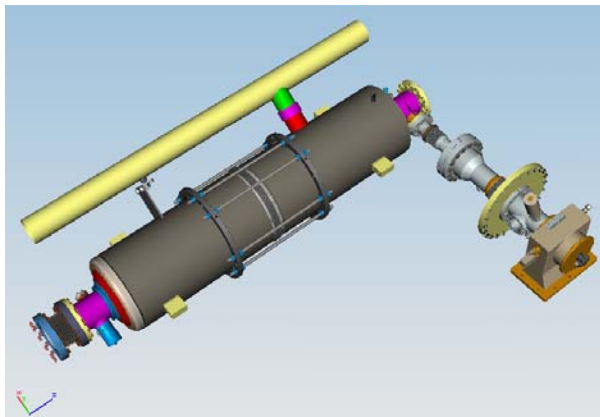
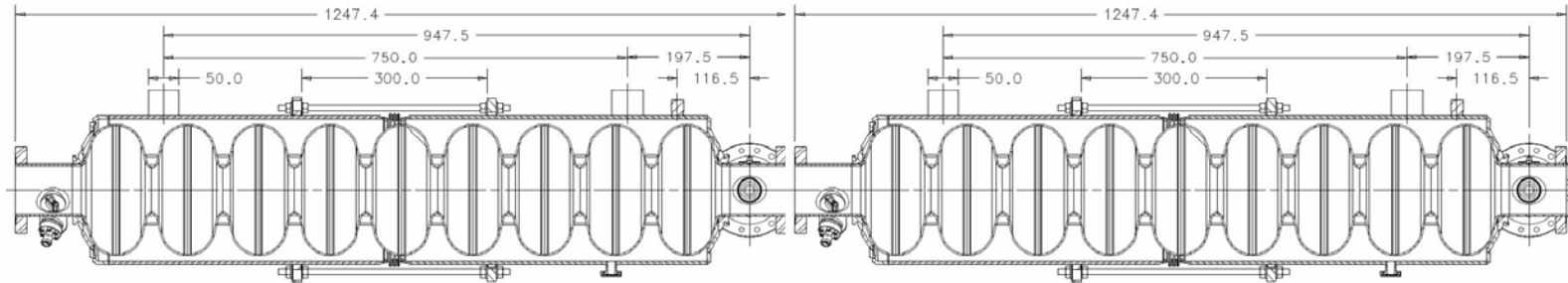


TDP R&D - SCRF





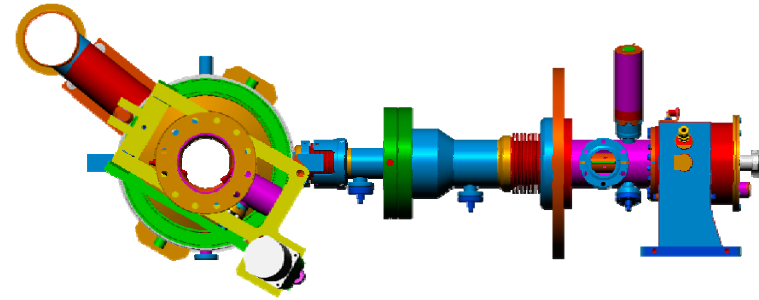
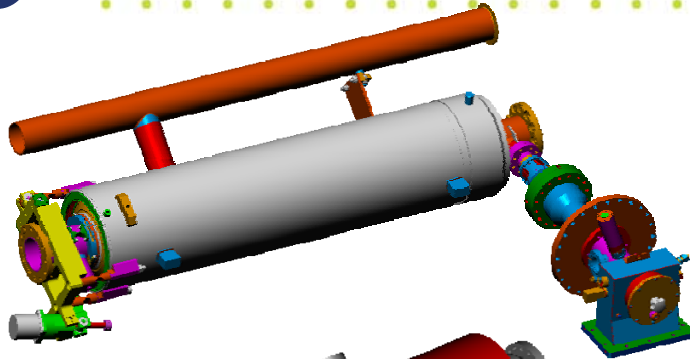
TDP R&D - SCRF



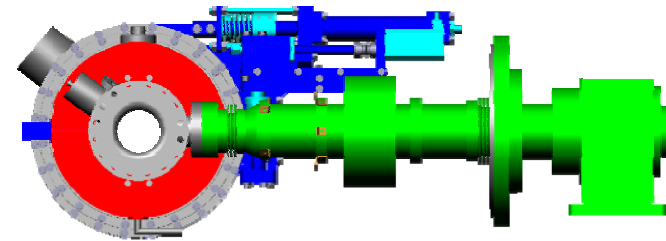
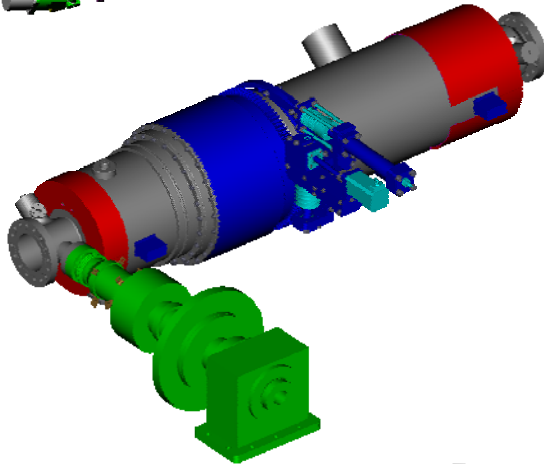


TDP R&D - SCRF

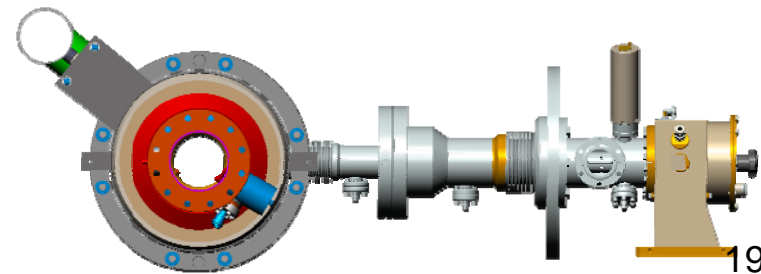
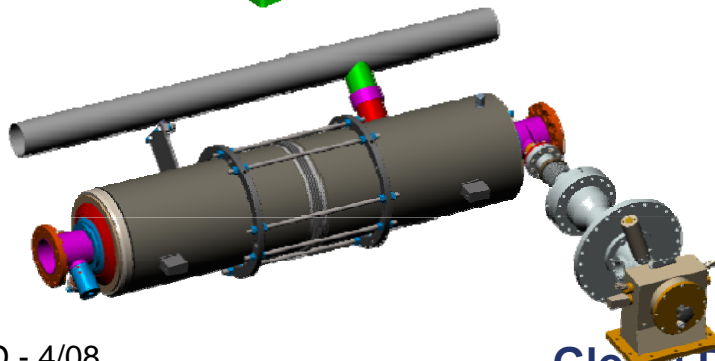
DESY



KEK



FNAL

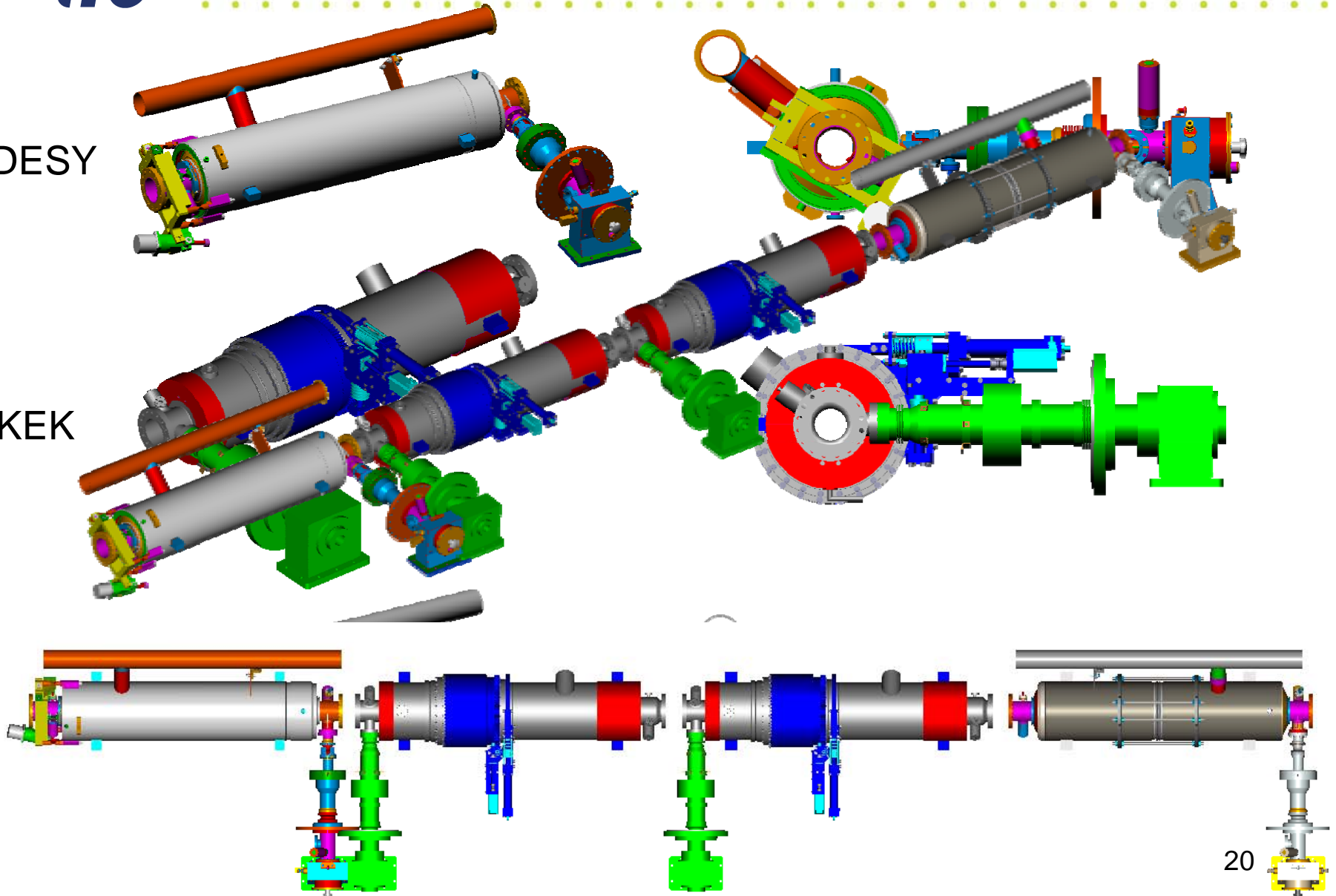




TDP R&D - SCRF

DESY

KEK



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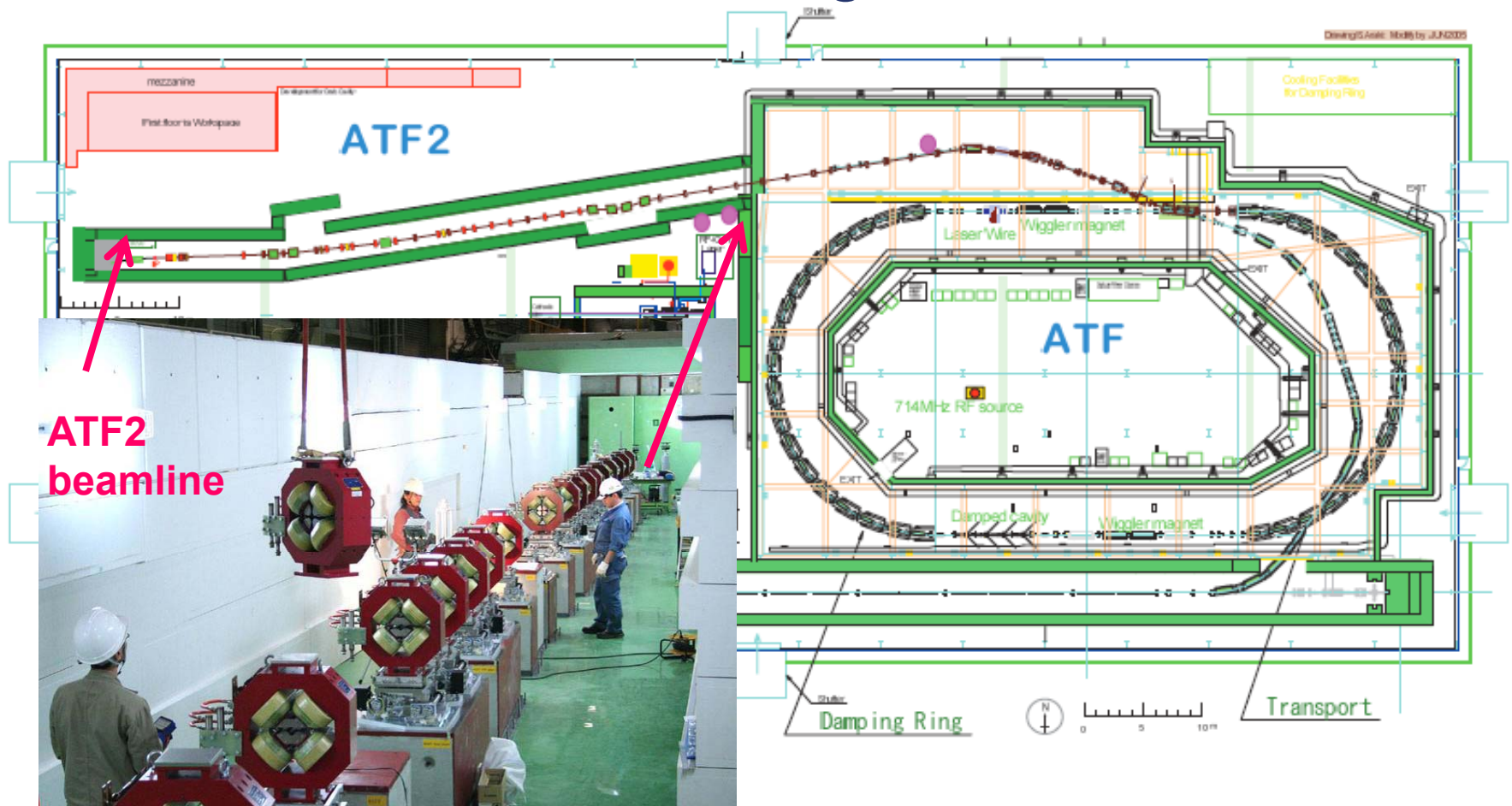
TDP R&D – BDS/MDI

- Perhaps group most strongly affected by “Black December” – dominated by UK/US.
- A great deal will have to be put on hold – but work is continuing on highest priority issues.
- Remember that ATF2 due to come on line in Oct! Will be of major importance for BDS studies and much more!



TDP R&D – BDS/MDI

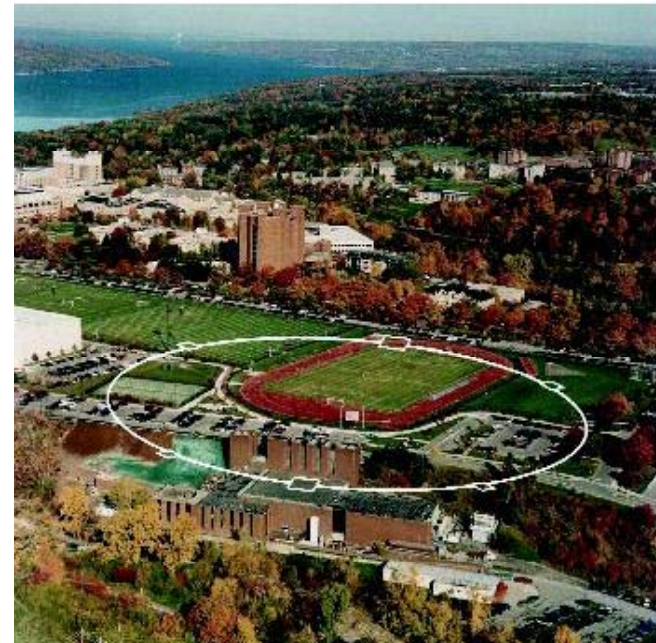
- ATF collaboration > 200 scientists, 20 institutions. ATF2 designed for ILC.





TDP R&D – DR

- One of areas where significant critical R&D remains to be done – if particular in properties and defences against electron-cloud effect.
- CESR-TA project (funding ~agreed from NSF with some matching funds from DoE)





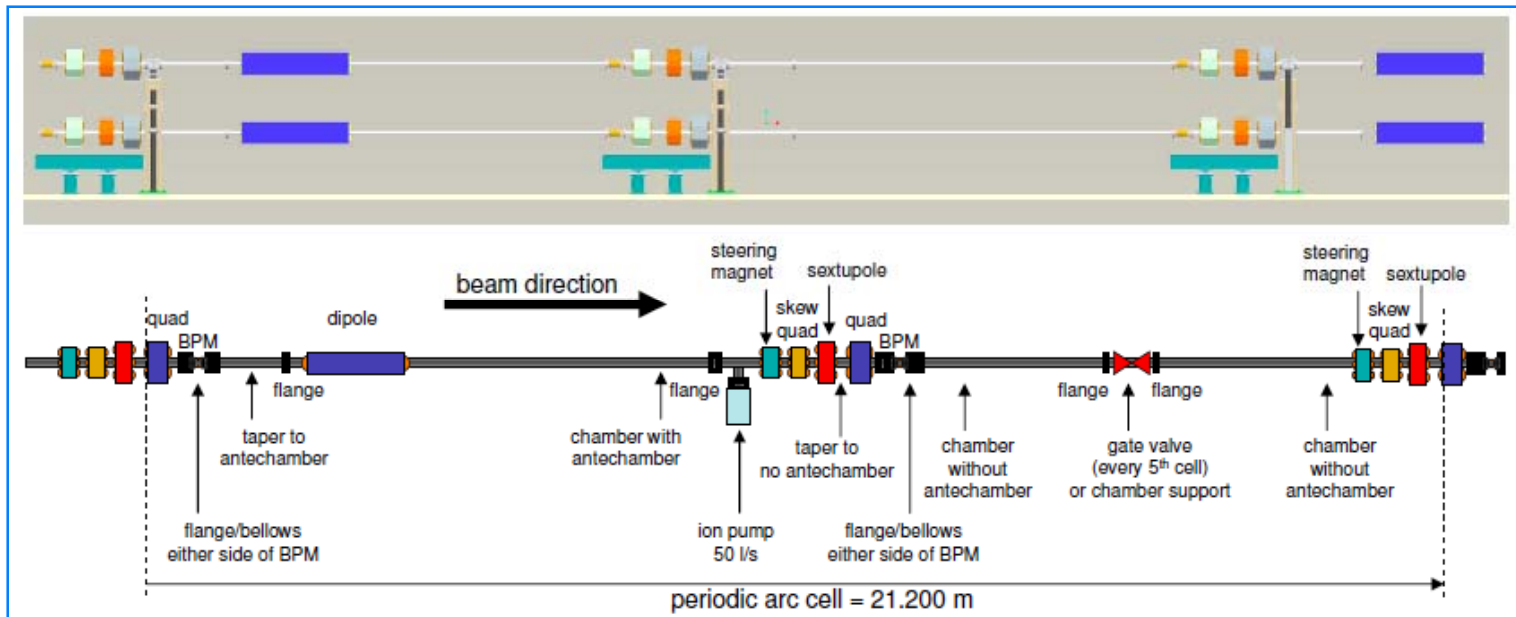
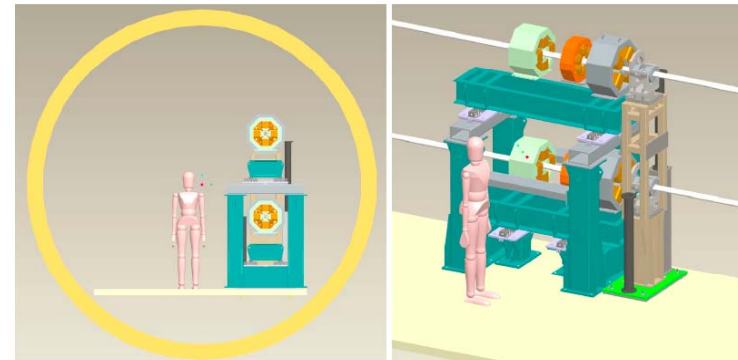
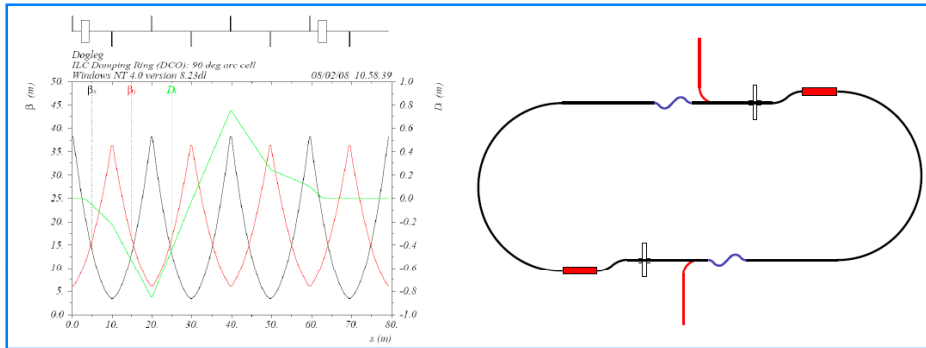
TDP R&D – DR

- Some High and Very High Priority R&D Items that Can Be Addressed at CesrTA...
 - Electron Cloud
 - Growth in quadrupoles, dipoles, and wigglers
 - Suppression in quadrupoles, dipoles, and wigglers
 - Instability thresholds and emittance growth in the positron damping ring
 - This issue has become more significant due to the decision to employ a single positron damping ring
 - Ion Effects
 - Instability thresholds and emittance growth in the electron damping ring
 - Ultra-low Emittance Operation
 - Alignment and Survey
 - Beam-based Alignment
 - Optics Correction
 - Measurement and Tuning
 - Fast (single bunch) high voltage kickers for injection/extraction
 - >100 kV-m of stripline kick required
 - <6 ns wide pulse into a 0.3 m long stripline so as not to perturb neighboring bunches in the damping ring
 - Development of 650 MHz SRF System



TDP R&D – DR

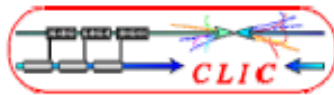
- DR lattice defined:





ILC-CLIC synergy

- Meetings going on and planned before “Black December”. Latest @ CERN in Feb.



Conclusions - CFS



- Interaction Area is obvious area where resources can be shared
- Civil Engineering models can be worked on ‘in parallel’ for ILC & CLIC.
- Other possible areas of collaboration in the TS area : Ventilation, Electricity, Handling....
- Resources to be defined, if limited, then perhaps Joint ‘Value Engineering’ exercises could be the way forward, rather than full blown studies.....
- First milestone : At Sendai meeting develop deliverables for 2008 for ILC Value Engineering and ILC/CLIC common efforts
- Identify link persons for highlighted areas
- CFS Video meetings will continue with possible CLIC input on specific subjects



ILC in UK

- UK still supporting ILC Common Fund – nevertheless, we were told that work on LCABD, LCFI & CALICE will “stop”.
- I have been working with J. Womersely and “Accelerator Group” including K. Peach et al., to rescue whatever possible from LCABD wreckage. Agreement reached on ongoing (3-year) programme at around £1M/year. Safeguards leading management roles in GDE + engineering and small R&D and travel/cons.



ILC in UK

- Also substantial resources left in EuroTeV until end of year; expect STFC to allow around 6 months per FTE effort from around May/June before termination. Things will likely reduce to minimum plateau by end of 08.
- Not so easy for detector collabs. – LCFI and CALICE. Hope to be able to continue “generic” aspects. Discussions with various organs at STFC continue.
- We have agreed that UK institutions will sign Eols, Lols, whatever....




ILC in EU

- HiGrade is for “Preparatory Phase” and is intended for projects on the ESFRI Road Map.
- We have now agreed the boundaries of the project, EU starting documents received – started on Feb 1st. “Site selection & governance” is ~ 50% of effort; remainder in SCRF and cavity production on back of XFEL.
- “Son of EuroTeV” submitted – substantial request from UK which can be matched with planned STFC effort. Lots of competition.



ILC in US

- The only thing predictable about the US pp budget is that it is unpredictable.
- However, signs seem positive. GDE request for DoE budget line increased from 30M (50% of the level hoped for after Black December) to 31.5M. MH has detailed plan for restoring work in FY09.
- Now working its way through Congressional process 
- But election year –may have to survive on continuing resolution until ~ Feb?

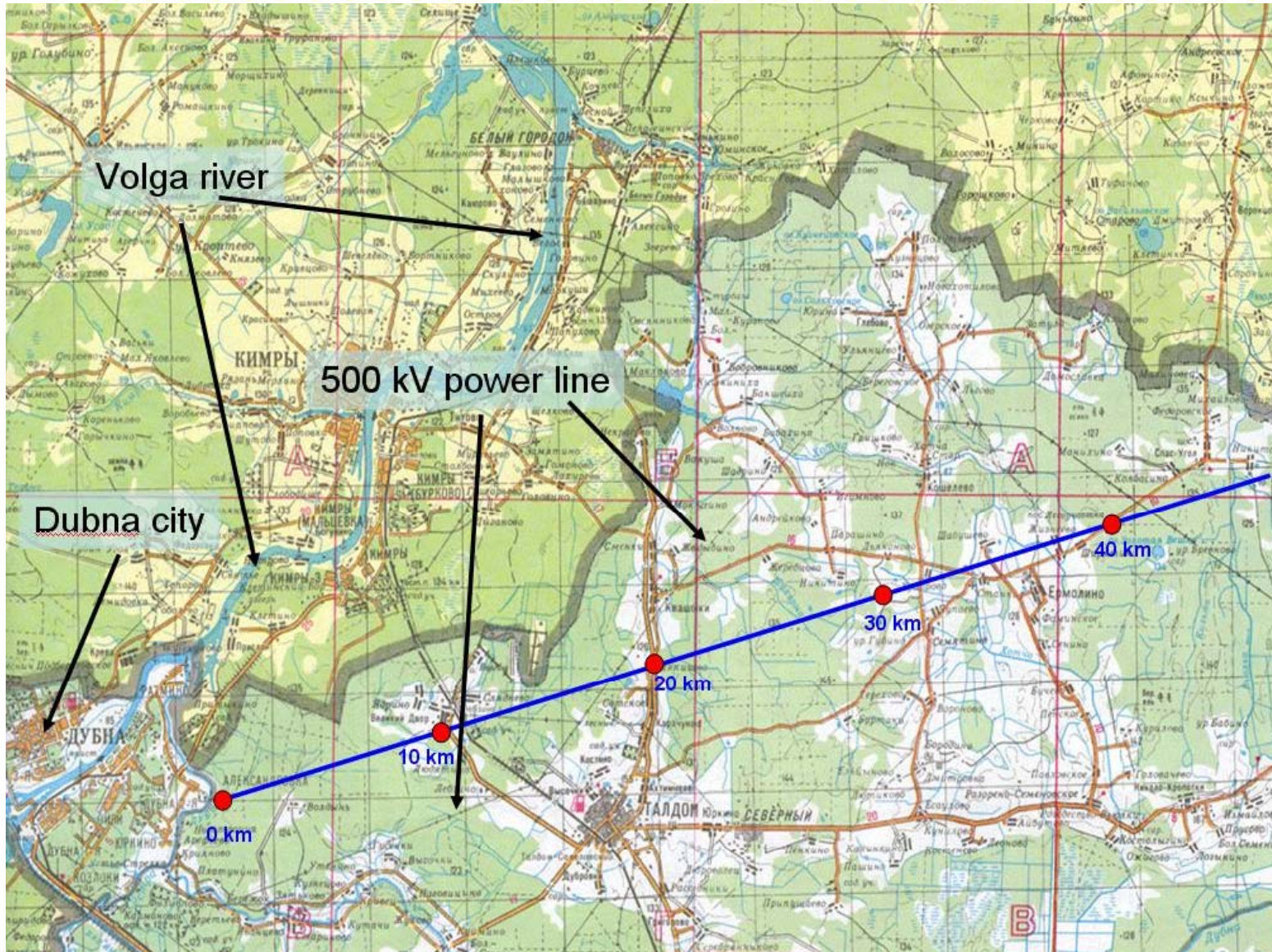


Future meetings

- April 7-8 DESY Zeuthen
 - Positron source meeting
- April 21-25 FNAL
 - SRF Main Linac Technology Review
- **June 4-6 JINR (Dubna)**
 - **GDE Meeting: ILC CFS Workshop**
- July 7-11 Cornell
 - Damping Ring Workshop (CESR-TA)
- November 16-20 Chicago
 - LCWS / GDE Workshop

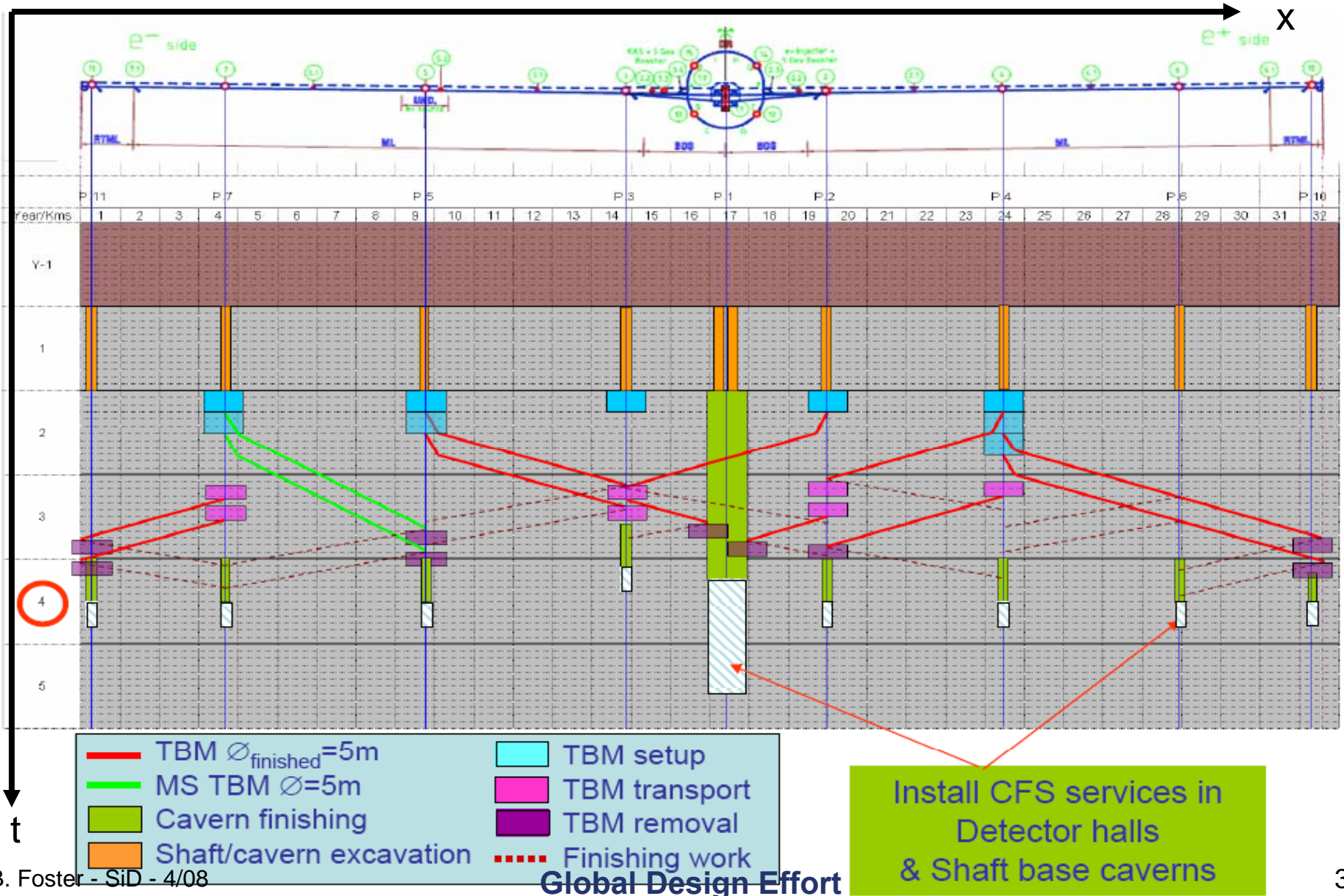


Dubna Site





Civil Construction Timeline





Dubna meeting

WGs	Subjects	Convener
1	Shallow solutions: Explore features and develop reduced-cost, shallow tunnel solutions. Both CLIC and ILC. Includes single tunnel.	Dubna+ILC-CFS(CERN)
2	Infrastructure: Review infrastructure requirements and develop cost-effective solutions for accelerator infrastructure – power, water, air etc. Both CLIC and ILC.	Dubna+ILC-CFS (KEK)
3	Siting: Examine possible sites and evaluate possible design differences that accommodate features. Includes staging, design modifications and upgrade issues.	AS+ Integration
4	Accelerator Systems: particular focus on the central injection complex, BDS and RTML, including beam dynamics.	Two AS leaders



Summary

- **“Black December” has been a major setback to the prospects of the ILC and particularly affects UK & US**
- **It has precipitated a major rethink of the way forward and we now have a new plan.**
- **Many details still need to be resolved to get all the R&D back on the road in a coherent way.**
- **No sign of any “domino” effect and strong determination among all to stay the course and produce design for this machine.**