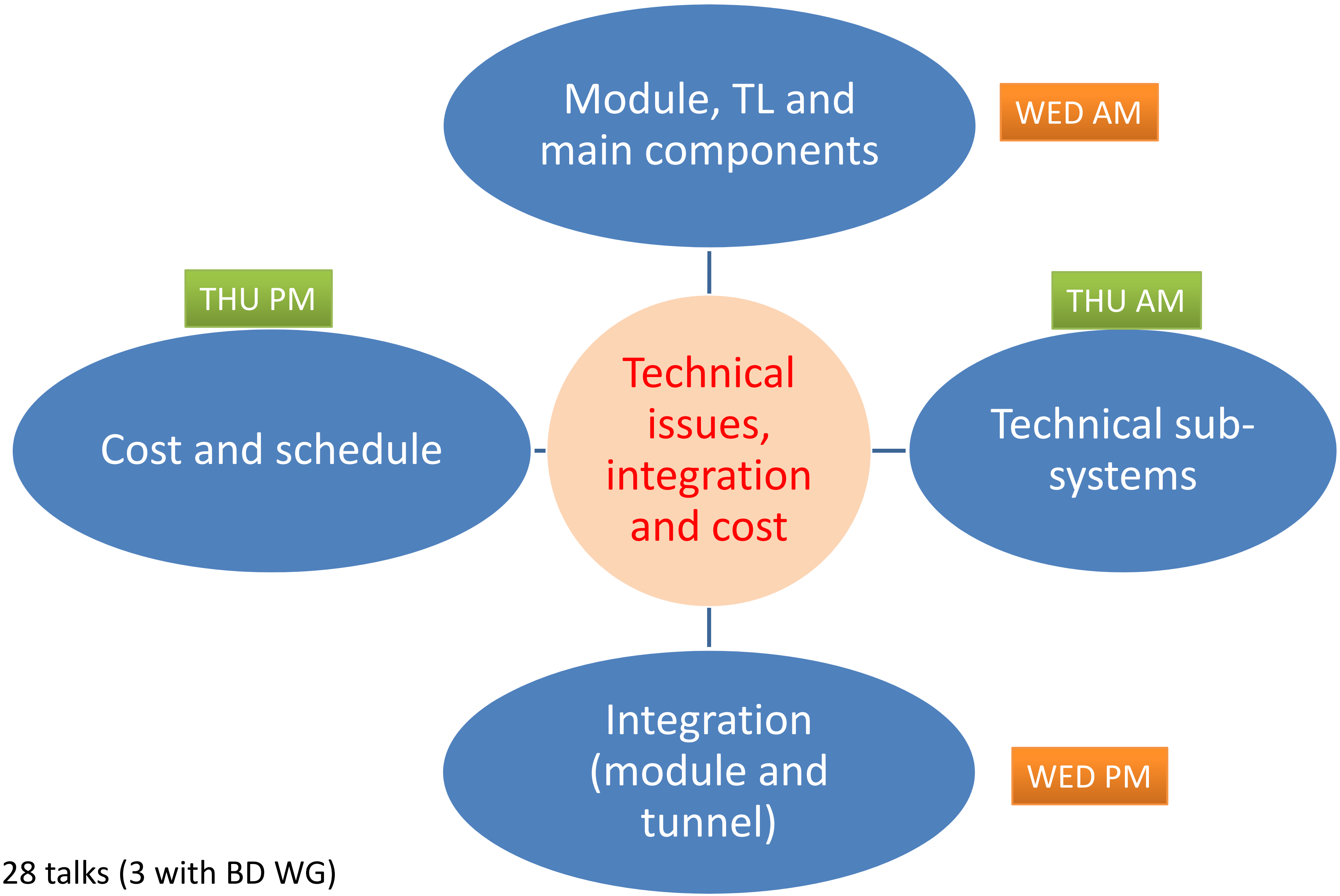
Summary of the WG Technical Issues, Integration & Cost

G. Riddone, R. Ruber

17.10.2008



28 talks (3 with BD WG)
Very interesting and well prepared talks.

THANKS TO ALL SPEAKERS

About 25 participants
Very fruitful discussions

CLIC08 workshop

CLIC module layout and main requirements

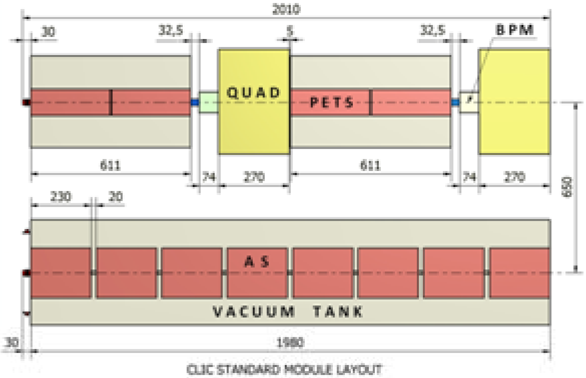
G. Riddone, on behalf of the CMWG

15.10.2008

Home page of the TBM WG: http://clic-meeting.web.cern.ch/clic-meeting/CLIC_Module_Wkg/index.htm

Module main types and numbers

Standard module

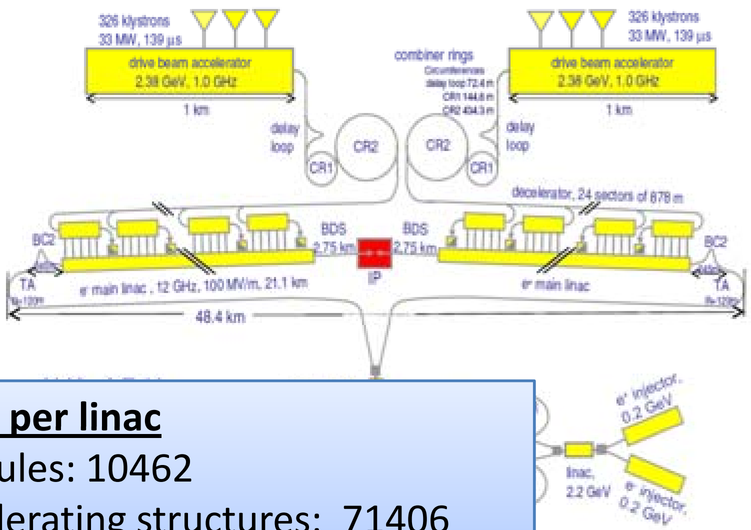


Total per module
8 accelerating structures
8 wakefield monitors

4 PETS
2 DB quadrupoles
2 DB BPM

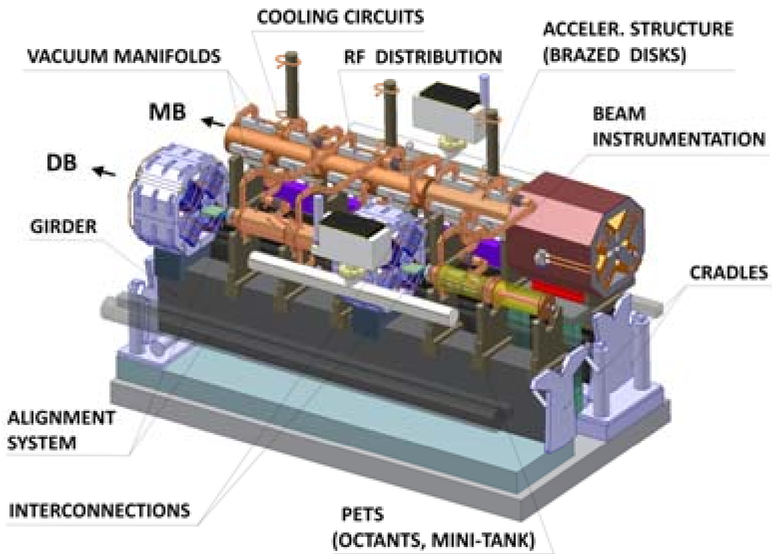
Total per linac
8374 standard modules

CLIC layout



Total per linac
Modules: 10462
Accelerating structures: 71406
PETS: 35703

Configuration #2



Collaboration with Dubna-JIRN, CEA-Saclay, HIP

MLQ Requirements and Constraints

Accelerator Technology Department

> 4000 Main Linac quadrupoles

Beam energy increase requires variation of integrated field gradient in the range between 15 Tm/m and 370 Tm/m

Aperture and field requirements

- Magnetic length: between 350 and 1850 mm
- Field gradient: 200 T/m
- Aperture radius: > 4 mm

Baseline: 4 types of different length

Alternative: several magnets of one type connected in series

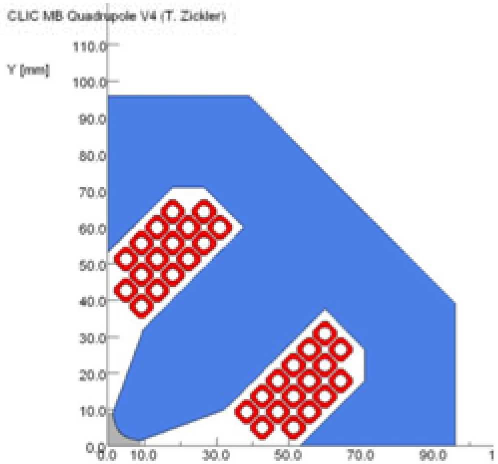
Small aperture, long structure

- High mechanical precision
- Tight manufacturing and assembly tolerances
- Good mechanical stability

MLQ Mock-Up Layout

Accelerator Technology Department

CLIC Main Linac Quadrupole (V4e)	
Magnet	
Nominal gradient	200.1 T/m
Nominal integrated gradient	370.0 Tm/m
Aperture radius	5.0 mm
Iron length	1844.0 mm
Effective length	1849.0 mm
Total magnet weight	393.3 kg
Total magnet length	1914.7 mm
Total magnet width	192.0 mm
Total magnet height	192.0 mm
Coil	
Conductor height	5.6 mm
Conductor width	5.6 mm
Cooling hole diameter	3.6 mm
Total number of turns	16
Cooling	
Number of cooling circuits per coil	1.0
Pressure drop	4 bar
Current density	6.59 A/mm2
Temperature rise	22.3 K
Coolant velocity	1.1 m/s
Total cooling flow	2.6 l/min
Electrical parameters	
Nominal current	140 A
Magnet resistance (hot)	20.10 mOhm
Power consumption	410.59 W
Total stored energy	420.7 kJ
Inductance	42.9 mH
Voltage drop (RT)	29.3 V



CLIC Magnet Work Package

Accelerator Technology Department

- ➔ CDR end of 2010 asks for:
  - More detailed information, integration concepts, basic layouts and feasibility studies, preliminary cost estimates
- ➔ Detailed Work package description (draft)
  - Document defines scope, responsibilities and required resources
  - Work package split into 4 main tasks
    - Mock-up quadrupole for the stabilization bench
    - Drive Beam Decelerator Quadrupole study: Large number of magnets (> 40 000), heat dissipation, alternative solutions (hybrid magnet)
    - Beam Line and Injector Magnets: feasibility study, functional specification and preliminary cost estimate
    - Main Linac Quadrupole Study: Mechanical, thermal and magnetic stability, field quality, manufacturing and assembly tolerances, cooling layout

Objective of the presentation:

illustrate the design for the stabilization bench

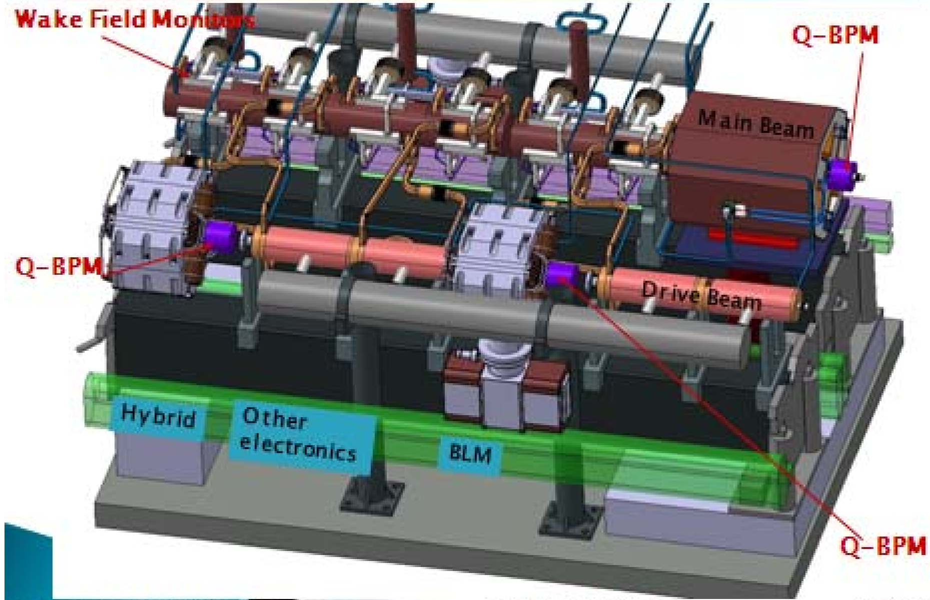
Options have to be studied (need new collaborators)

Specification from beam physics to magnet group

Feed back from magnet group is needed

Preliminary design of a quadrupole for the stabilization bench T. Zickler

CLIC module, Type 1



BPM and WFM specifications

Main beam

Nominal beam parameters: Charges/bunch : $3.7 \cdot 10^9$ - Nb of Bunches: 312, Bunch length: 45µm-70µm, Train length: 156ns

	Accuracy	Resolution	Stability	Range	Bandwidth	Beam tube aperture	Available length	Intercepting device?	How many?	Used in RT Feedback?	Machine protection Item?	Comments	Ref
BPM	5µm	50nm	100nm		35MHz	8.0mm	95/65mm	No	4176	Yes	Yes	Choke BPM? Inductive BPM	CLIC note 764
WFM	5µm	<5µm			35MHz	5.5 mm	"-"	No	142812	Yes	No	TM01~16GHz	CLIC note 764

Intensity!

Drive beam

Nominal beam parameters: Charges/bunch : $5.2 \cdot 10^{10}$ - Nb of Bunches: 2922, Bunch length: 1mm, Train length: 243.7ns

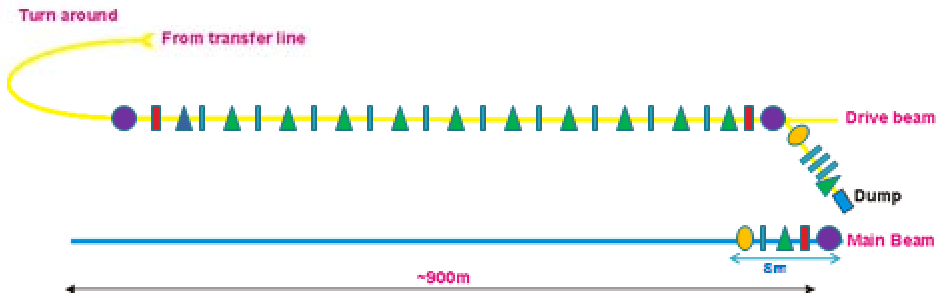
	Accuracy	Resolution	Stability	Range	Bandwidth	Beam tube aperture	Available length	Intercepting device?	How many?	Used in RT Feedback?	Machine protection Item?	Comments	Ref
BPM	20µm	2µm	?	<5mm	35MHz	23mm	104/74mm	No	41480	Yes	Yes	Inductive ? Strip line ?	CLIC note 764

Intensity!

Summery

- Module instrumentation is mainly BPM's and WFM. Requirements are well defined.
- A dedicated study and design of CLIC BPM's and WFM is needed.
- Space must be foreseen for electronics on the module and in a radiation shielded location within a few meters, i.e. in the floor.
- A digital front-end, reduces significantly the cable costs.
- Drive beam SECTOR instruments should be designed for type 1 - 4 modules.
- Main beam SECTOR instruments can only be foreseen close to extraction region on module types 0n-3n.
- Specifications are crude but under the way

Sector instrumentation

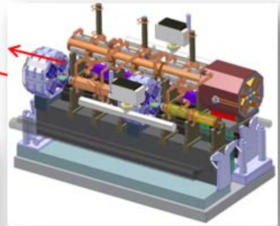


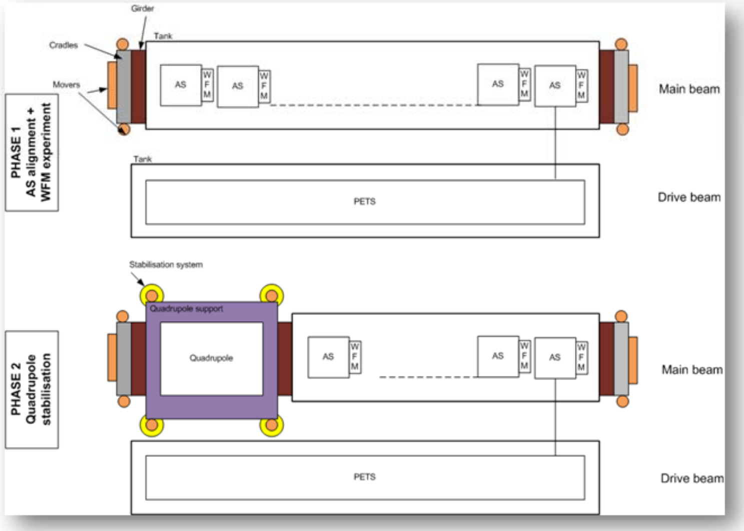
- Transverse profile monitors, DB=13pc,L~300mm
- Fast (12GHz) BPM, L~100mm, Energy
- Form factor, Fast bunch shape measurement,L~500mm
- Slow current measurement, DB /50m, L~150mm, 1%
- Slow current measurement, DB=1, L~150mm, 0.1%
- Beam Phase
- Segmented dump, Energy

Module instrumentation, L. Soby

Test module

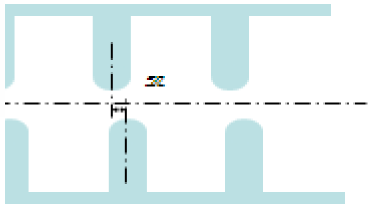
Test module, as much as possible close to the final CLIC module





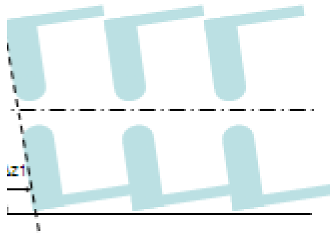
• CEA/France will participate in the design of acc. structures with wakefield monitor

Bookshelf or longitudinal misalignment of half-structure



Structure in quadrants

problem mainly for the machining and assembly



Structure in disks

problem mainly for the brazing (assembly); probably easier to achieve

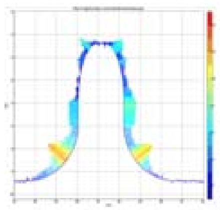
Tolerances: 1 micron or 180 μrad

HIP collaboration

7

Machining compensation

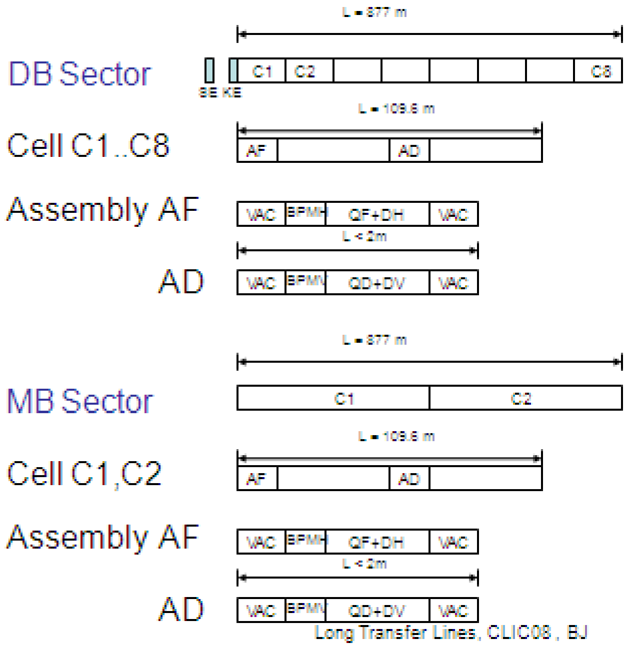
- Ongoing test
- Test structure manufactured by milling
- Aim is to improve the shape accuracy by compensating the shape of the tool



Future work

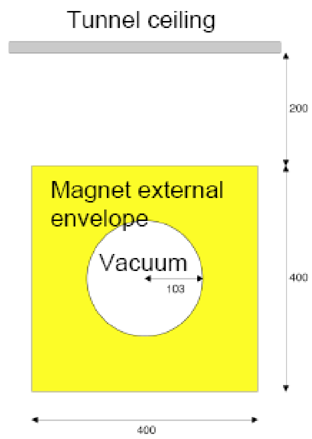
- Solving the mechanical design problems concerning tuning
- Optimizing the disk design
- Testing the assembly accuracy concerning rotational errors
- Selecting the possible manufacturing strategies and manufacturing larger series of components

Structure Fabrication and Assembly Tolerances, R. Zennaro
Test module and precise machining/assembly of acc. Structures, J. Huopana



Layout by Sector For Drive Beam & Main Beam

Magnets, DB & MB



- Quadrupole and dipole embedded
- Forces
  - Quad : Gl = 0.14 Tm/m
  - Dipole : Bl = 0.03 Tm
  - Same for DB & MB
  - > not demanding for electrical supply & cooling
- Length : as yet free
  - say l < 2 m
- MB : need solid static positionning (yet to make it a specification)
- Need free space for survey

Summary

- Long transfer line
  - Compact and light combined magnet are considered
  - Conflict services / beam line / survey must be resolved
- DB Turnarounds
  - Optics exists, but need to adapt to C.E. constraints
- '5th Beam line' between TA and input decelerator
  - Now non-negligible fraction of the linac length
- DB Dump line
  - Short 10m section with two lines must be studied
  - Dump exit through main tunnel to be solved (water pipe on the way)
  - Dump proper still to be designed

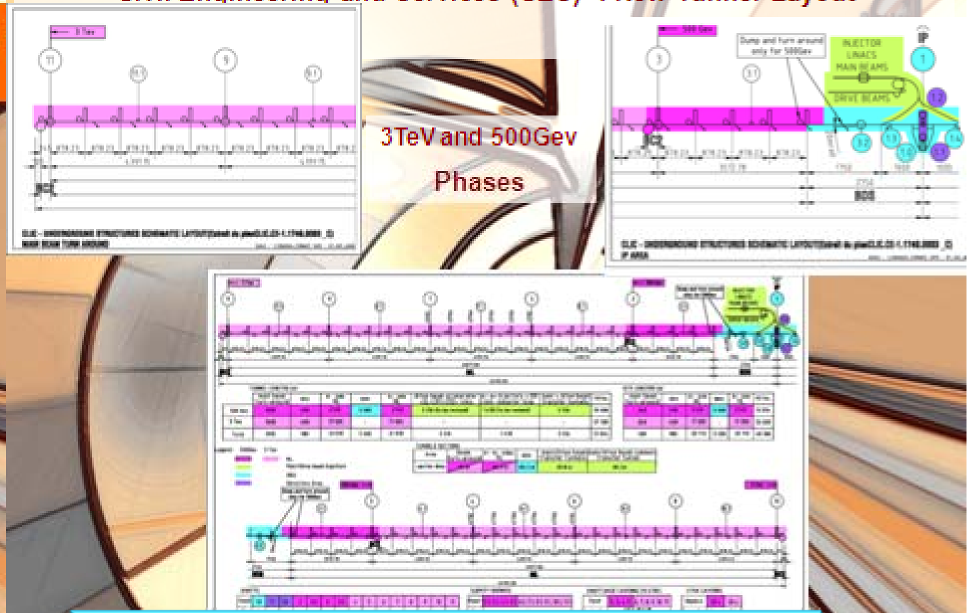
Now requires detailed engineering studies

Long transfer lines, J. Jeanneret

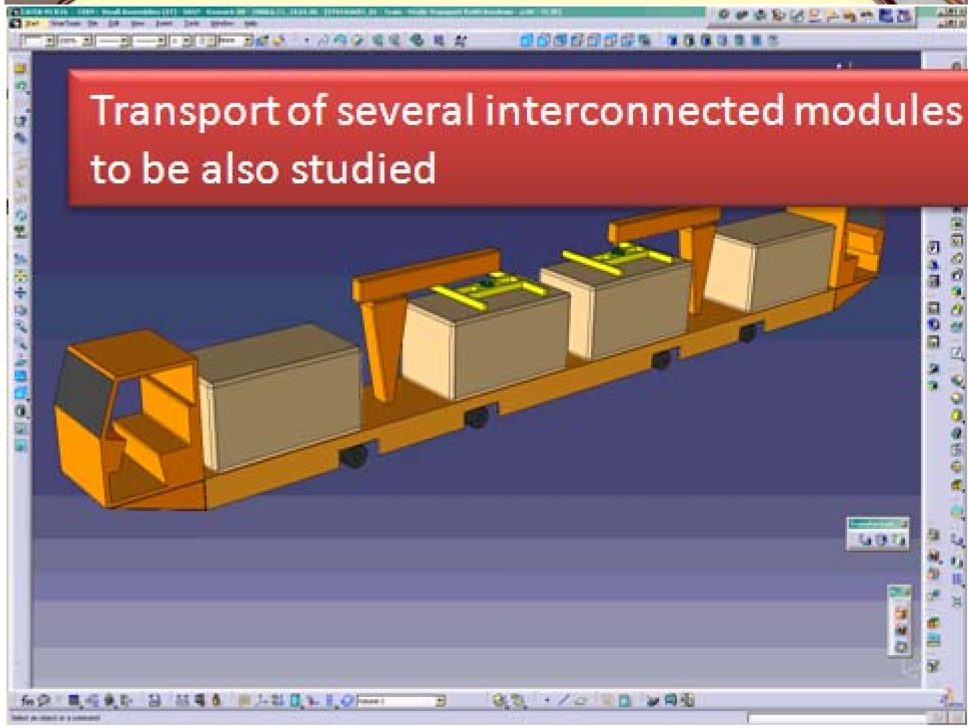
Main modifications / progress to civil engineering layouts in 2008:

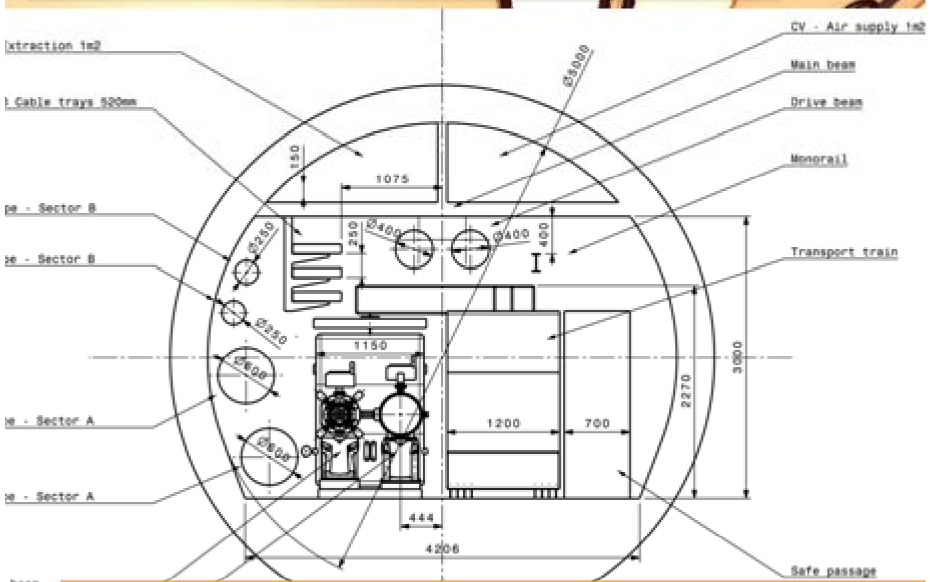
- 500 GeV phase introduced
- New Longitudinal Section – reduced depth
- New Layout – Beam dumps at variable positions
- 3d modelling for turnarounds
- Cross section studies

Civil Engineering and Services (CES) : New Tunnel Layout



Point symmetry or plane symmetry?





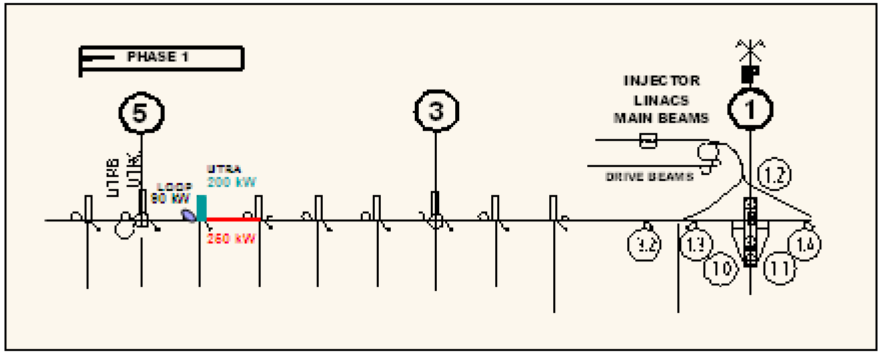
Tunnel layout, J. Osborne
Transport of CLIC elements, K. Kershaw

CLIC WORKSHOP – Ventilation

Heat loads in the air

Drive Beam sector = 250 kW
UTRA cavern = 200 kW
Loop = 90 kW

(to be reduced)



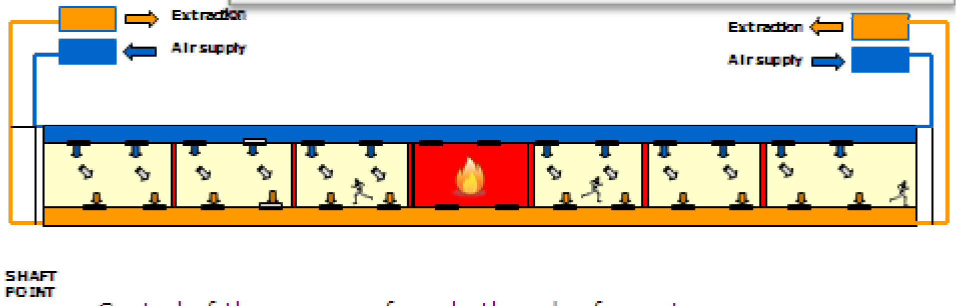
Heat loads in the tunnel:
250 kW / DB sector
1250 kW between two shafts

Heat loads in the Loops & UTRA:
290 kW / DB sector
1450 kW between two shafts

CLIC W...

Safety ...

- Heat loads in tunnel air to optimize
- Heat loads in Exp. caverns, Klystrons to be defined?
- Radiation levels in the various areas to be defined
- Integration of ventilation ducts in the tunnel section to finalize



- 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.

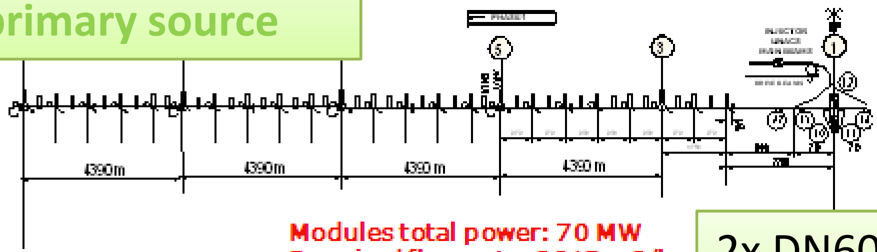
Comparison CLIC/ILC

CLIC WORKSHOP - Cooling

Water cooling requirements

Modules cooling (circuit A)

Cooling tower or primary source



Modules total power: 70 MW
Required flow-rate: 3215 m3/h
Delta temperature: 20 K
Temp. Supply: 25 °C

2x DN600
2x DN250

CLIC WORKSHOP - Cooling

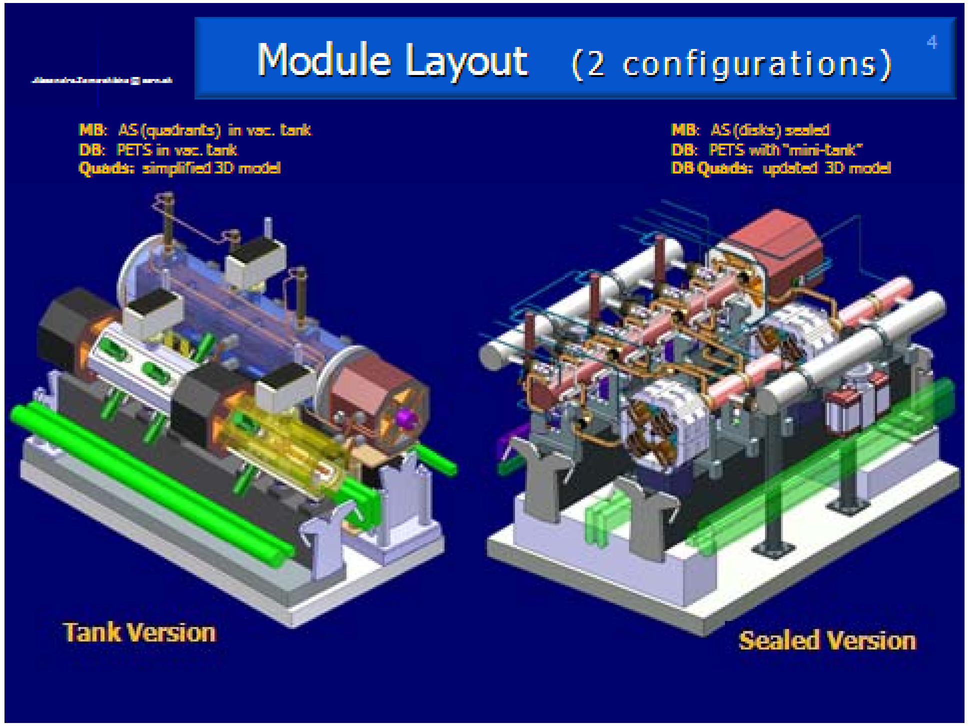
Missing items affecting main cooling station

- Cooling power for experimental cavern ?
- Cooling power for Main dumps
- HVAC and cooling for klystrons
- Confirmation about the rate air/water

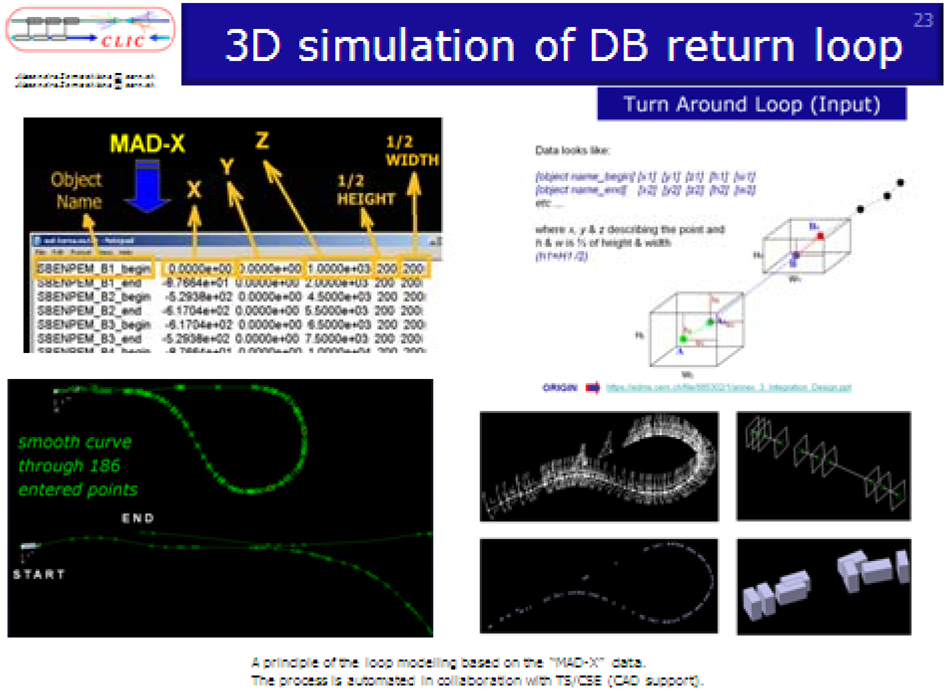
Other items to be considered:

- Fire-fighting flow-rates
- Infiltration water, raising pumps, slopes

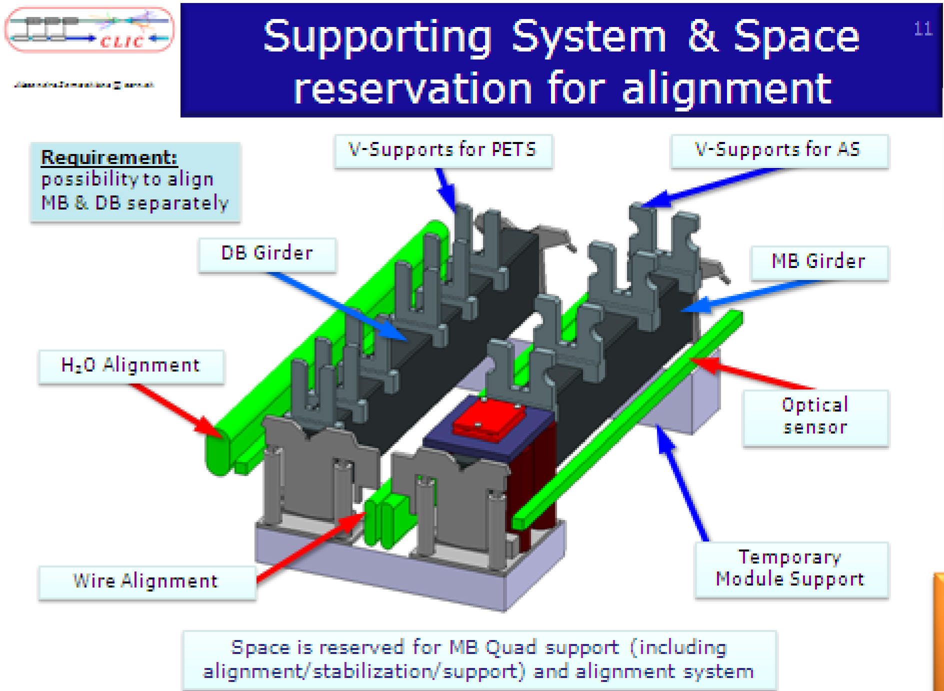
Cooling and ventilation in the tunnel,
J. Inigo-Golfin, Ch. Martel



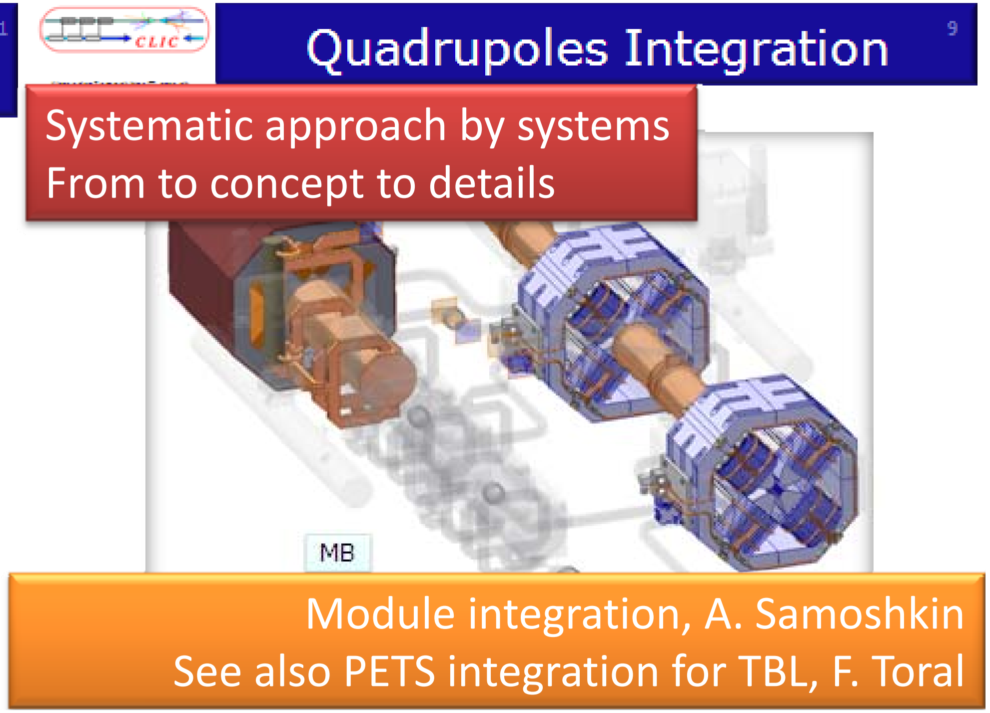
Module Layout (2 configurations)
4
MB: AS (quadrants) in vac. tank
DB: PETS in vac. tank
Quads: simplified 3D model
MB: AS (disks) sealed
DB: PETS with "mini-tank"
DB Quads: updated 3D model
Tank Version
Sealed Version



3D simulation of DB return loop
23
Turn Around Loop (Input)
MAD-X
Object Name
X
Y
Z
1/2 HEIGHT
1/2 WIDTH
smooth curve through 186 entered points
END
START
A principle of the loop modelling based on the "MAD-X" data.
The process is automated in collaboration with TS/CSE (CAD support).



Supporting System & Space reservation for alignment
11
Requirement:
possibility to align MB & DB separately
V-Supports for PETS
V-Supports for AS
DB Girder
MB Girder
H₂O Alignment
Optical sensor
Wire Alignment
Temporary Module Support
Space is reserved for MB Quad support (including alignment/stabilization/support) and alignment system



Quadrupoles Integration
9
Systematic approach by systems
From to concept to details
MB
Module integration, A. Samoshkin
See also PETS integration for TBL, F. Toral

CLIC 08 WORKSHOP

ILC UNDERGROUND CONSIDERATIONS AND GENERAL COLLABORATION Clic/cfs AND ILC/CFS EFFORTS

ILC CONVENTIONAL FACILITIES AND SITING GROUP

V. Kuchler

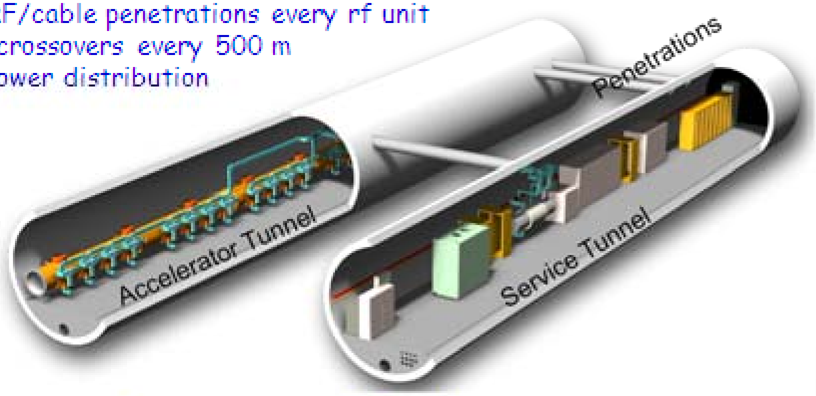
Specific Areas of Common Interest

- Underground Configuration
- Process Cooling
- Heating, Ventilation and A/C
- Access Egress and Life Safety
- Survey and Alignment
- Radiation Requrirements
- Cost Estimating for Conventional Facilities
- Others as Identified

ILC Underground Consideration, V. Kuchler

Main Linac Double Tunnel

- Three RF/cable penetrations every rf unit
- Safety crossovers every 500 m
- 34 kV power distribution



Conventional Facilities

- 72.5 km tunnels ~ 100-150 meters underground (for US, Asia, and CERN cites)
- 13 major shafts ≥ 9 meter diameter
- 443 K cu. m. underground excavation: caverns, alcoves, halls
- 92 surface "buildings", 52.7 K sq. meters = 567 K sq-ft total

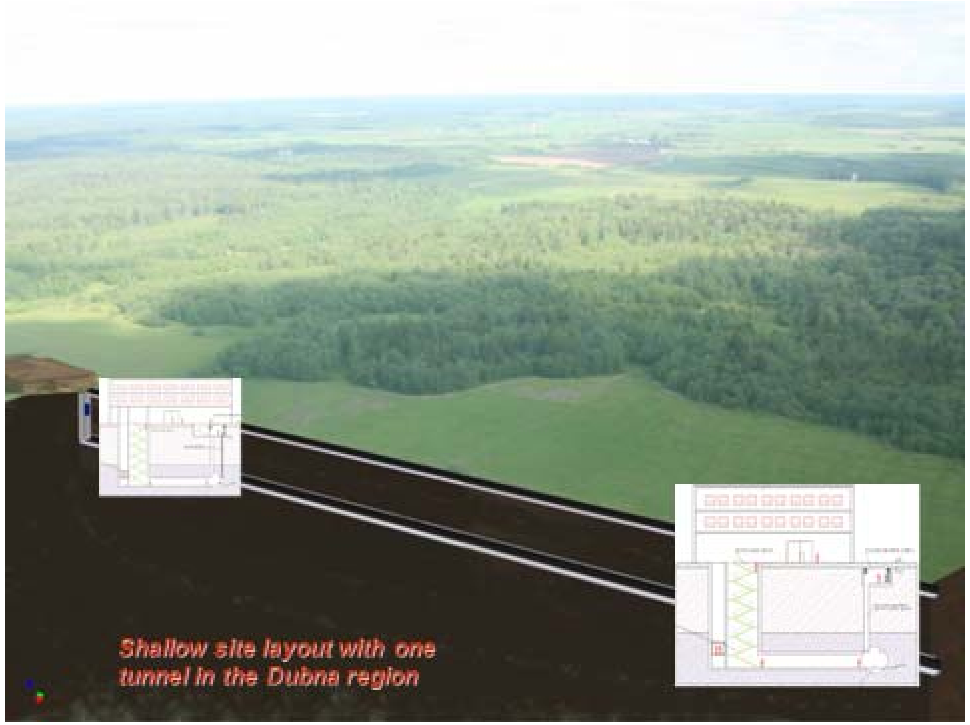
JINR PARTICIPATION IN R&D OF ILC SUBSISTEMES AND IN RELATED PROJECTS

1. Construction of ILC photoinjector prototype.
2. The LINAC-800 based test-bench with electron beam
3. Development of power supply devices for RF system
4. Metrological laser complex
5. Development and design of cryogenic modules and test systems.
6. Preparation of technical base of cryogenic supply to test cryomodules of the 4th gen.
7. Calculation of electrical and magnetic fields
8. Engineering survey and design works
9. Development of the electron cooling method. LEPTA project.
10. Project CLIC
11. Project FLASH
12. Development of diagnostic systems; development of built-in devices.
13. Development of magnetic systems of the ILC damping rings
14. Development of diagnostics for large cryogenic systems.

Personnel ~ 100 persons

Salary	Ind. grants	Travels	Contracts	Equipment &materials	Total
97 x 650$ x 12 months x 1,26 x 0,5 = 480 k$	100	90	RSPI: 20 Sarov 10 **Total 30**	200	**900**

In total year 2007 ≈ 900 k$ (personnel 580 k$ + travels 90 k$ + R&D 230 k$)



Dubna Siting and ILC Activity at JINR, G. Shirkov

Radiation level in the tunnel, T. Otto

Hadron fluence on tunnel wal

- Guideline for CLIC: $\Phi_{20} < 10^6 \dots 10^7$/year

	E (GeV)	e^-_{loss}/ year	Φ_{20} ($cm^{-2}\ y^{-1}$)	Consequence for electronics
Main Beam	1500	1 E14	1 E09	Unacceptably high failure rate
Main Beam	9	1 E15	5 E07	More failures per year
Drive Beam	2.4	1 E16	1 E07	Few failures per year
Drive Beam	0.24	1 E17	5 E06	Few failures over lifetime

:lusions

- Ionising radiation levels must be controlled by control and reduction of beam loss
- Fractional beam loss levels for limiting dose to magnets to $D < 1$ MGy y^{-1} are challenging, but achievable.
- At these levels, standard electronics in the tunnel suffers high failure rate due to SEE
- First calculations indicate that at these levels, ambient dose rate during the shutdown require standard intervention practice, and little or no remote handling gear.

Radiation level in the interaction regions to be studied

Distance between access pits for different machines:

- SPS~=1200m
- LEP-LHC~=3000m
- ILC-CLIC~=5000m To be confirmed

Cost reduction requires to reduce number of access pits...law of the double every 20 years?

Need to assure quick and easy evacuation of personnel in case of accident

In conclusion-Sectorization:

- Has to be decided at early layout stage
- Integration of walls with equipment assembly, disassembly, calibration
- Integration with transportation
- Requires additional ducts
- Has a cost

- Safest approach for personnel evacuation
- Confines equipment damage
- Reduces dispersion of isotopes
- Allows effective intervention of fire brigade
- Reduces recovery time and costs
- Allows compliance with benchmark codes

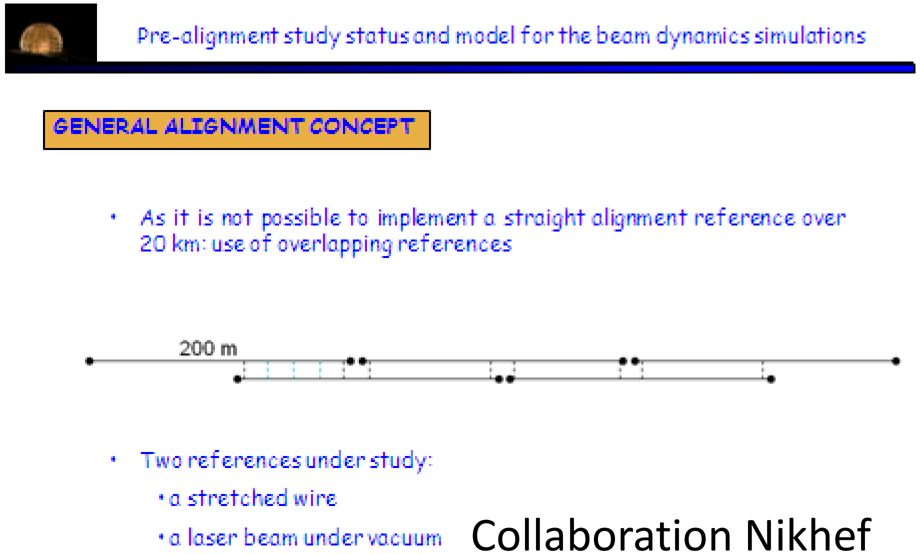
Thank you

Safety issues for underground structures, F. Corsanego

Topic for Chicago Meeting ILC08

Simulation on propagation network and on CLIC modules ➔Promising results ➔ input for beam dynamics simulation

Discussions on space reservation and integration of survey equipment



Collaboration Nikhef

Wire: Validation test are underway at CERN (TT1, T500)
Sensors: capacitive based WPS sensors
Development of an optical -based WPS sensor
MBQ: fiducialisation, align/stab. compatibility

We also would like to open the CLIC survey and alignment studies to the Survey groups from other labs (FNAL, SLAC, Argonne, KEK, DESY), in particular concerning the development and qualification of sensors. The first contacts have already been taken.

CLIC
NANO STABILISATION

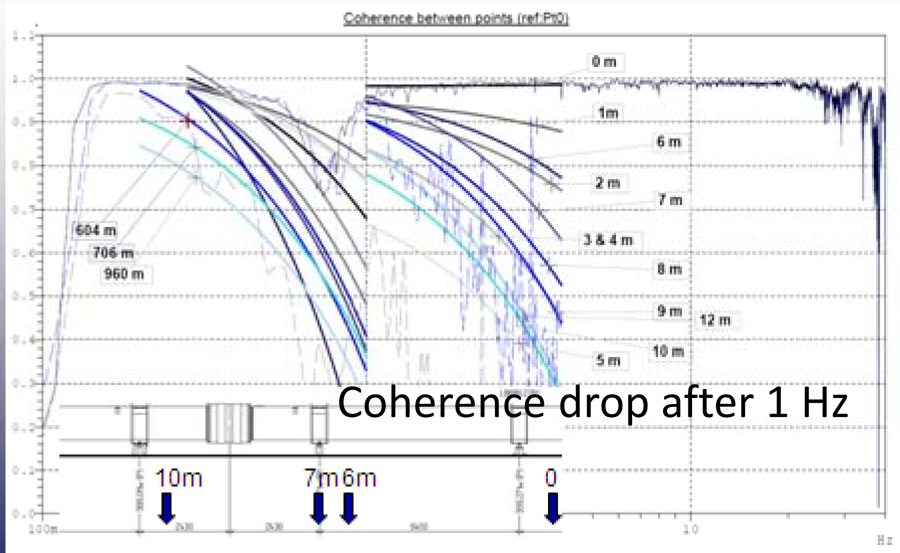
"Recent ground vibration measurements at CERN "
(Surface and underground)

Comparison with other measurements and overview methods

K.Artoos, M. Guinchard

16th October 2008, CLIC workshop

Coherence measurements LHC tunnel



Conclusions

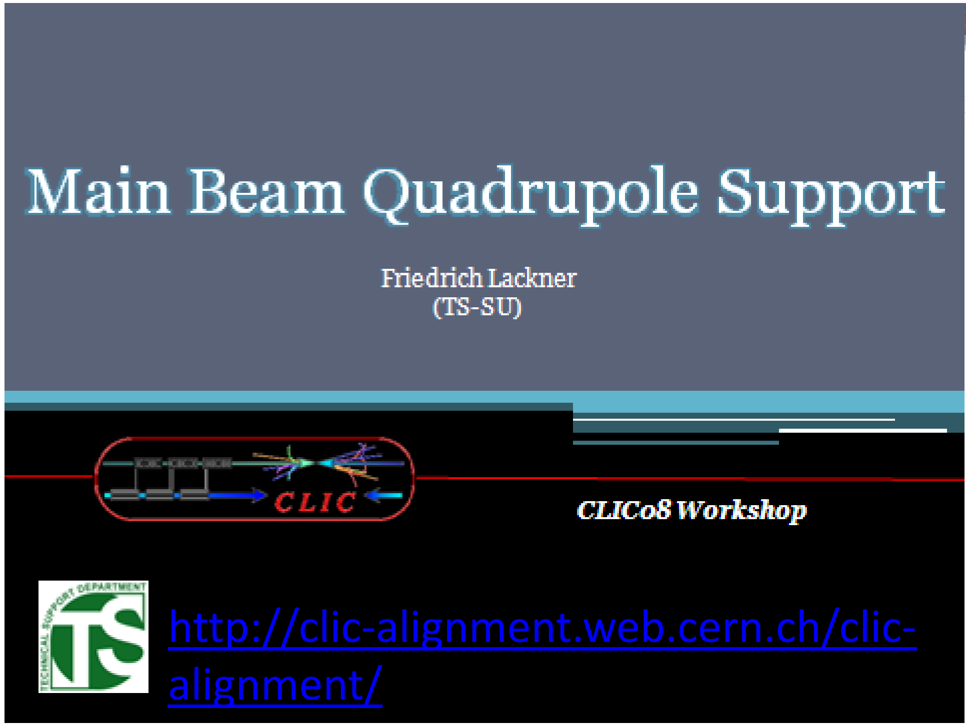
- Ground vibration level between 1 and 10 nm "average integrated RMS" at 1 Hz seems possible.
- Possible vibration sources like water cooling and ventilation should be carefully designed.
- Support or objects can amplify the ground vibration levels
- The ground vibration level can be increased by the resonance of a support or object
- For frequencies > 1Hz, coherence drops over a short distance

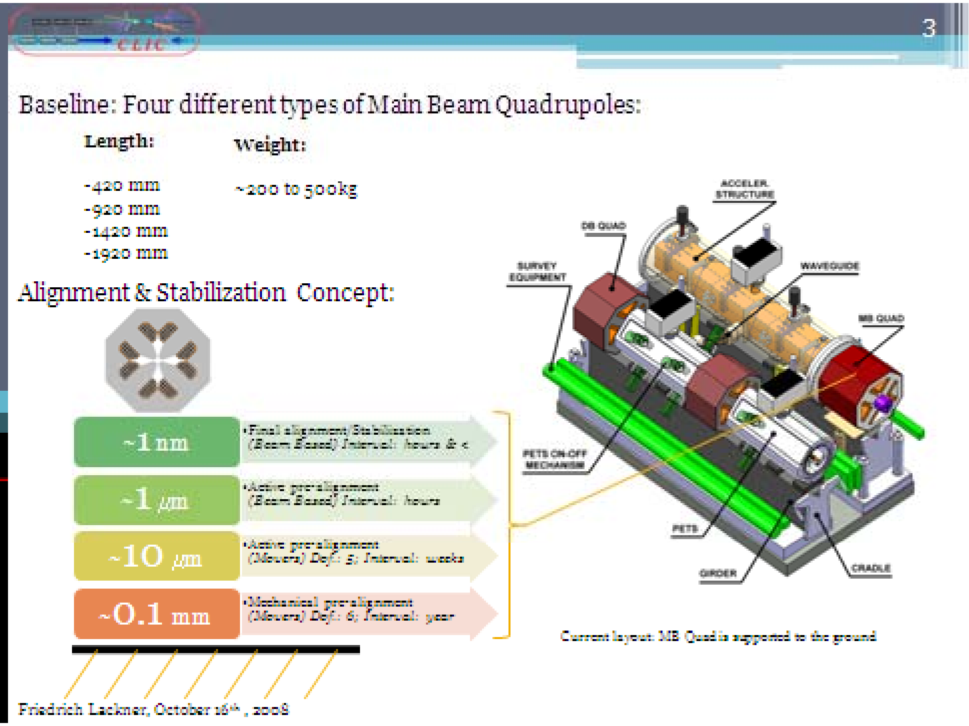
- It is possible to measure (averaged) nanometre displacements with seismometers but some characterisation of devices and analysis methods is still needed.
- Seismometers with better signal to noise ratio are needed for active control purposes.

	Final Focus quadrupoles	Main beam quadrupoles
Vertical	0.1 nm > 4 Hz	1 nm > 1 Hz
Horizontal	5 nm > 4 Hz	5 nm > 1 Hz

Actions:

- Sensors: types and measurement methods
- Characterize vibrations/noise sources in an accelerator: K. Artoos talk
- Actuators: techniques to be developed for heavier (up to 400Kg) and larger structures (up to 2 meter long)
- Feedback: Develop methodology to tackle with multi degrees of freedom (large frequency range, multi-elements)
- Overall design + analysis: compatibility alignment/stabilisation – mock-up for main linac
- Integrate and apply to Linac: discussion started with CESRTA (storage ring) , request ATF2





Start with CTF2 stepper system reactivated (implementing present alignment sensors)

- modal analysis, stiffness of the support ➔ which movers for CLIC

Market research for suppliers for stepper motor developments

Nano-membranes: possible solution of vertical stabilisation

Guiding flexure potential for horizontal stabilisation

Space limitations on current module design: needed extra space

➔ several solutions are under study and implemented within the module working group

Frictionless operation of the pre-alignment system by applying linear elastic deformation?

http://clic-alignment.web.cern.ch/clic-alignment/

CLIC workshop
" Technical Issues, Integration & Cost "
working group

Supporting System

Risto Nousiainen

16.10.2008

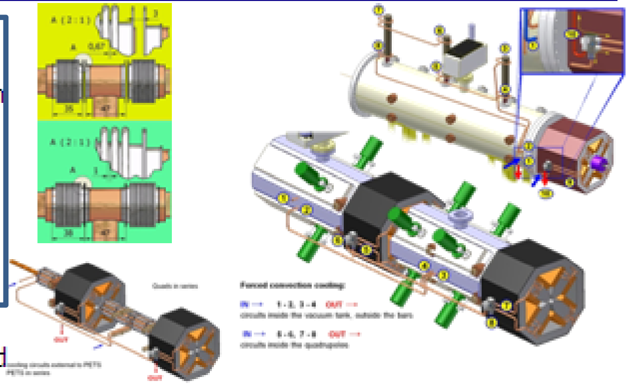
Mechanical analyses for the CLIC module

		ITEMS	Input	Work
Component	**Accelerating structure**	1		
	Modal analysis			
	Eigen frequencies		–	
	Cooling induced vibrations (CFD)		AS, R. Nousiainen	
	Frequency			
	Amplitude			
	Computational fluid dynamics analysis			
	Thermal analysis (define cooling system)			
	Steady state: Loaded condition (beam loading)		AS, A. Grudiev	
	Steady state: Unloaded condition (beam loading)		AS, A. Grudiev	
	Structural analysis			
	Effect of Gravity		–	
	Steady state		–	
	Thermal condition from CFD		–	
	Steady state: Loaded condition (beam loading)		AS, A. Grudiev	
	Steady state: Unloaded condition (beam loading)		AS, A. Grudiev	
	Transient: Unloaded to Loaded		AS, A. Grudiev	
	Precision assembly of the AS		AS, D. Schulte, R. Zennaro	
Sub-assembly	**Main beam girder assembly**	1,2,3,4		
	Modal analysis			
	Eigen frequencies		–	
	Minimize structural amplification		–	
	Structural analysis			
	Cooling (thermally) induced dilatations			
	Steady state: Loaded condition (beam loading)		AS, A. Grudiev	
	Steady state: Unloaded condition (beam loading)		AS, A. Grudiev	
	Transient: Unloaded to Loaded		AS, A. Grudiev	
	Effect of Gravity			
	Steady state		–	
	Define girder deflection		AS, R. Zennaro, TS, Friedrich Lackner	
Assembly	**Module**	1 - 17		
	Modal analysis			
	Eigen frequencies		–	
	Minimize structural amplification		–	
	Seating for transportation		AS, A. Samoshkin	
	Computational fluid dynamics analysis			
	Thermal analysis (including components of Circuit 3)			
	Steady state: Loaded condition (beam loading)		AS, A. Grudiev	
	Steady state: Unloaded condition (beam loading)		AS, A. Grudiev	
	Pressure drop		–	
	Structural analysis (simplified loading)			
	Cooling (thermally) induced dilatations			
	Steady state: Loaded condition (beam loading)		AS, A. Grudiev	
	Steady state: Unloaded condition (beam loading)		AS, A. Grudiev	
	Transient: Unloaded to Loaded		AS, A. Grudiev	
	Effect of Gravity			
	Steady state		–	
	Define girder deflection		TS, Friedrich Lackner	
	Steady state: Seating for transportation		AS, A. Samoshkin	
	Interconnections Intramodule			
	Steady state: AS - AS		–	
	Steady state: AS - MB Quad.		–	
	Steady state: PETS - PETS		–	
	Steady state: PETS - DB Quad.		–	
	Interconnections MB - DB			
	Steady state: choke mode flange		AS, I. Syratchev	
	Interconnections Intermodule			
	Steady state: module type x - Module type y (x,y ∈ [1..4])		–	
	Steady state: module coupling		–	

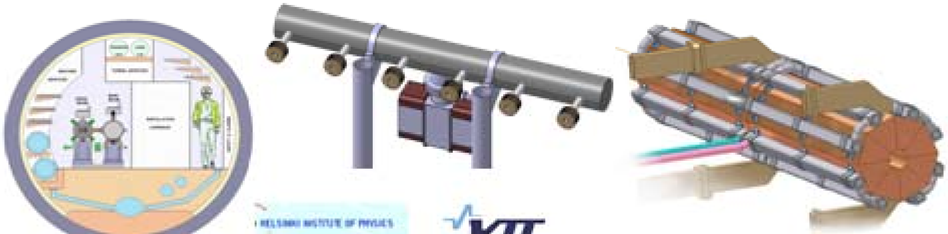
	ITEMS	
PETS	10	
Modal analysis		
Eigen frequencies		
Cooling induced vibrations (CFD)		
Frequency		
Amplitude		
Computational fluid dynamics analysis		
Thermal analysis (define cooling system)		
Steady state: PETS on (nominal)		
Steady state: PETS Max beam losses		
Structural analysis		
Effect of Gravity		
Steady state		
Thermal condition from CFD		
Steady state: PETS on (nominal)		
Steady state: PETS Max beam losses		
Precision assembly of the PETS		
Drive beam girder assembly	10, 11, 12, 13, 14	
Modal analysis		
Eigen frequencies		
Minimize structural amplification		
Structural analysis		
Cooling (thermally) induced dilatations		
Steady state: PETS on (nominal)		
Steady state: PETS Max beam losses		
Effect of Gravity		
Steady state		
Define girder deflection		AS, [illegible]

Integration requirement

- Alignment system
- Stabilization system
- Interconnections
- Vacuum system
- Cooling system
- Tunnel integration



- System interactions need to be assessed



Conclusions and future work

- Conceptual design of the supporting system is well advanced
- Module supporting system consist of extensive amount of R&D word in the near future
- Different subsystems and procedures such as alignment, stabilization, cooling, assembly, transportation and installation need to be developed as parts of supporting system.
- Organization of the work between collaborators is essential
  - Organization of work is on going
- Current work
  - Interconnection specification finalization -> soon to development iteration
  - Module assembly, transportation and installation sequence
  - Creek collaboration for the girder material studies
- Future work
  - Study mechanical model of the module
  - Next iterations for the specification for the supporting and alignment systems
  - Increase the amount of collaborators

Thank you!

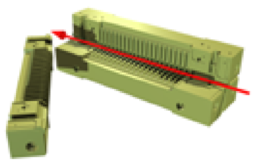
CLIC workshop
" Technical Issues, Integration & Cost " working group

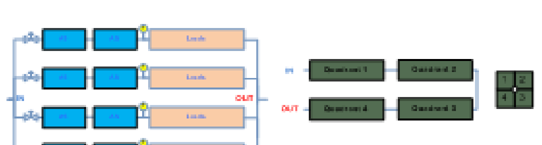
Progress on Study of Module Cooling

Risto Nousiainen

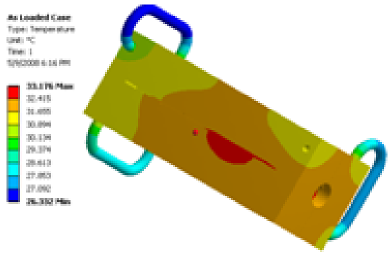
16.10.2008

First results for AS Cooling





Baseline of the routing



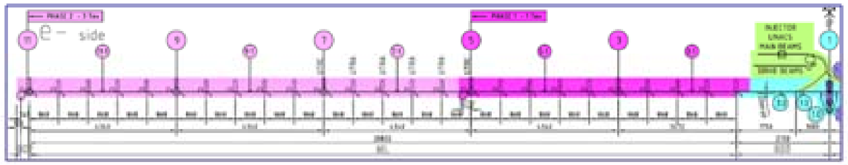
CFD – analysis

Cell to Cell power dissipations
P_{in} = 412 W (nominal power)

ΔT_{AS} = 6.8 K
ΔT_{Water} = 5 K (by definition with requirements)

Total ΔT_{Water} = 10 K

Cooling layout



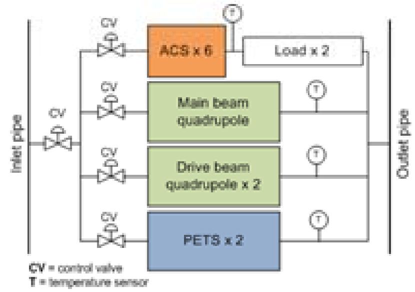
Baseline configuration

Flow / Linac: 3490 m^3/hr

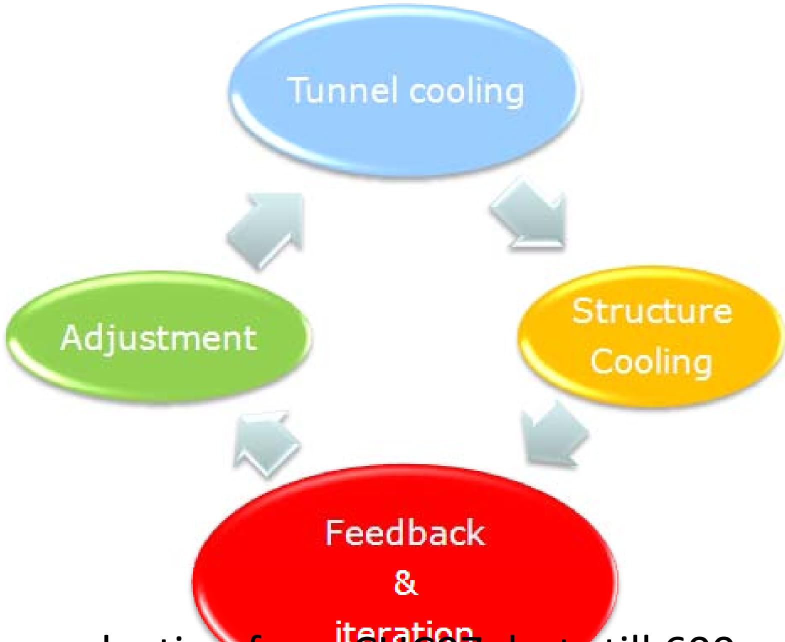
Flow / Module: 340 m^3/hr

$\Delta T_{linac} = \Delta T_{module}$ = 17.5 K
ΔT_{AS} = 10.2 K
ΔT_{PETS} = 10.2 K
ΔT_{DB_Q} = 10.2 K
ΔT_{Load} = 8.9 K
ΔT_{MB_Q} = 6.3 K

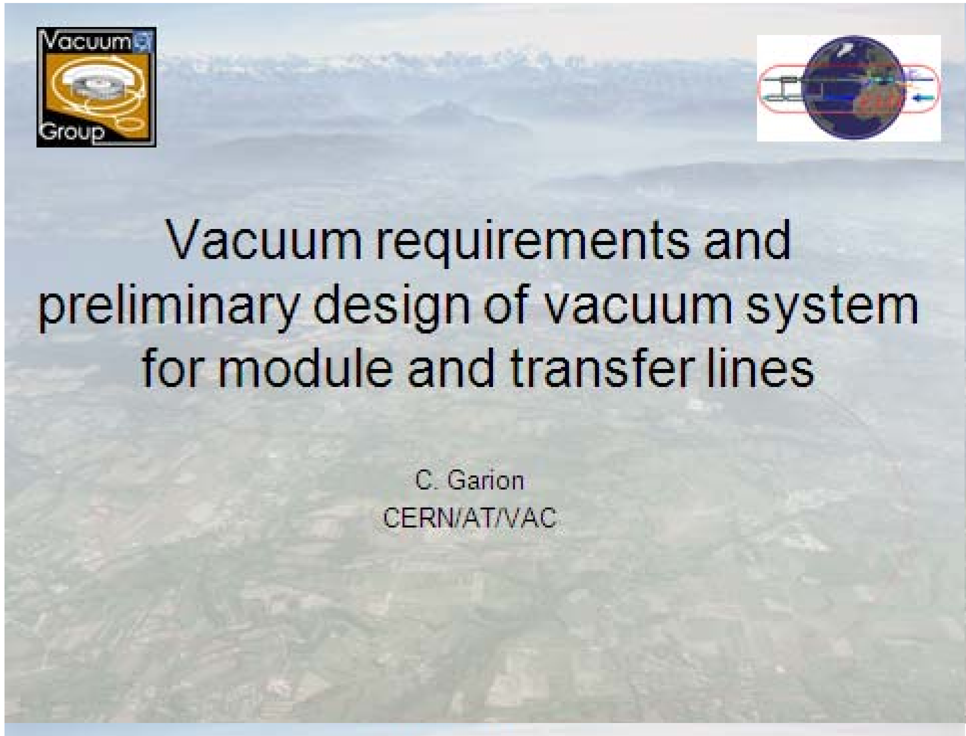
T_{in} = 25 °C

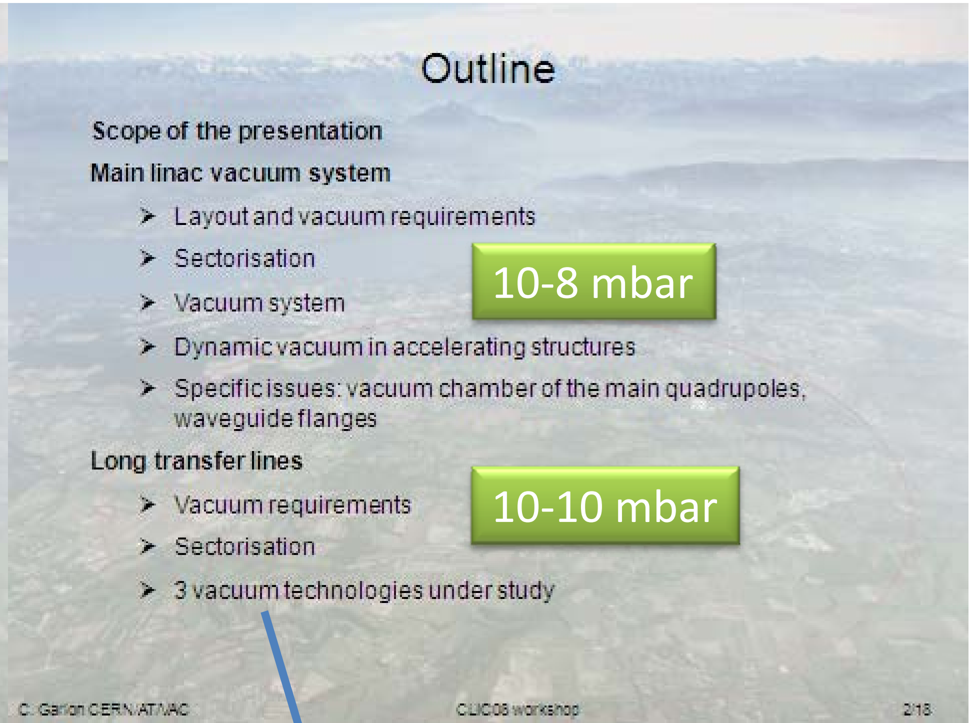


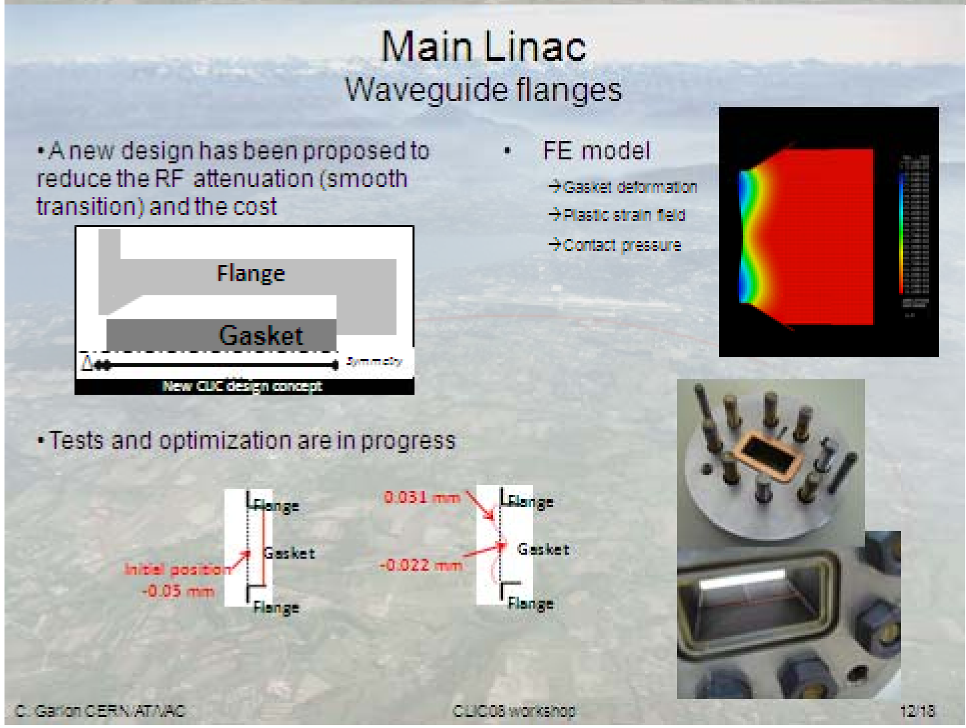
3 TeV and 500 GeV



Pipe reduction from CLIC07, but still 600 mm
Alternative cooling methods are under study







~80 km→ cost optimized solution is required
→ 3 possibilities have been considered:

- ➢ion pumps,
- ➢NEG coated vacuum chamber + ion pump
- ➢NEG strips + ion pump

CERN

European Organization for Nuclear Research
Organisation Européenne pour la Recherche Nucléaire

Integrated Project Support Study Group Findings

Study Group Members	
Jurgen De Jonghe	IT-AIS
Christophe Delamare	TS-CSE
James Purvis	IT-AIS (Chair)
Tim Smith	IT-UDS
Eric Van Uytvinck	TS-CSE
Additional Contributions from	
Jean-Yves Le Meur	IT-UDS
Per-Olof Friman	TS-CSE
Timo Tapio Hakulinen	TS-CSE
Nils Høimyr	IT-CS
Thanks for supporting information from	
Alessandro Bertarelli	TS-MME
Johan Burger	DESY
Ramon Folch	TS-MME
Lars Hagge	DESY
Don Mitchell	FNAL

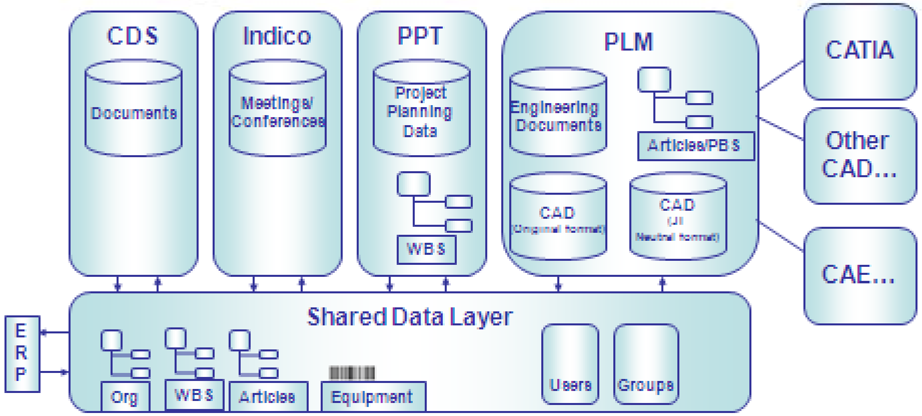
James Purvis

HR

Recruitment, Programmes & Monitoring

Full report:
https://edms.cern.ch/document/1247665684/1
http://cdsweb.cern.ch/record/971016/

Integrated Solution Architecture



Requirement to "future-proof" existing investments…

18

The Tools

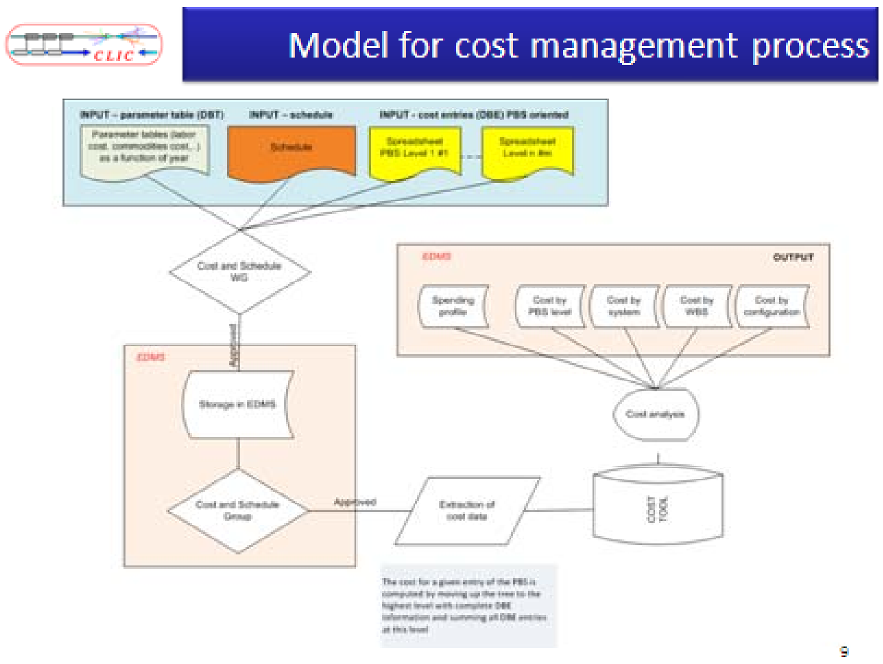
- CAD (Euclid/CATIA)
- Earned Value Management (EVM)
  - Project schedule & costing of the accelerator
- Project Progress Tracking (PPT)
  - Project management of the experiments
- Engineering Data Management System (EDMS)
- Indico
  - Event, Agenda, Conference Management
- CERN Document Storages (CDS)
  - Long term archiving

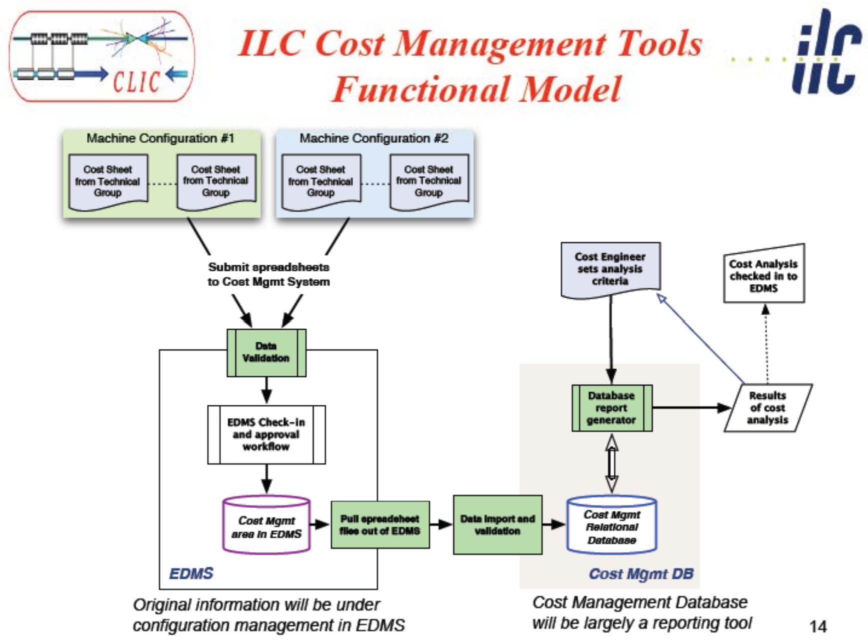
4

Strong recommendation: integrated tool from the first phase of the project

This is the good moment to define better tools for the whole community : what is available, what would be needed in the future?

Common reflection: common tool





Cost for 500 GeV and 3 TeV by 2010
(for each PBS entry and w/o detailed WBS)

- **Cost Management database (the focus of this talk)** Starting
  - **Roll-ups and analyses of cost estimate information**
  - **Consolidate spreadsheet data provided by technical groups**

ILC/CLIC collaboration

CLIC requirement for cost, H. Braun, G. Riddone
Software tool consideration for ILC cost management, J. Cawardine

Cost & Schedule Working Group

(CLIC/ILC webex meeting on 19th Sept 2008)

Hans Braun, John Carwardine, Katy Foraz, Peter Garbincius, Germana Riddone, Tetsuo Shidara, Sylvain Weisz

Cost & Schedule WG: Activities since ILC Meeting at Dubna

- *The work of each group continues …but essentially no joint activities since Dubna due to limited resources in both teams*

- **Costing templates**
  - **After comparing the latest ILC and CLIC templates, the approaches are similar but the details are quite different (impractical for common template?)**
  - **But… we should still explore possible use of common methodologies**

- **Cost Management processes and tools**
  - **ILC tool development has re-started with the hiring of Triad Consulting**
  - **CLIC has engaged CERN computing group to explore software options, including expansion of in-house tools**

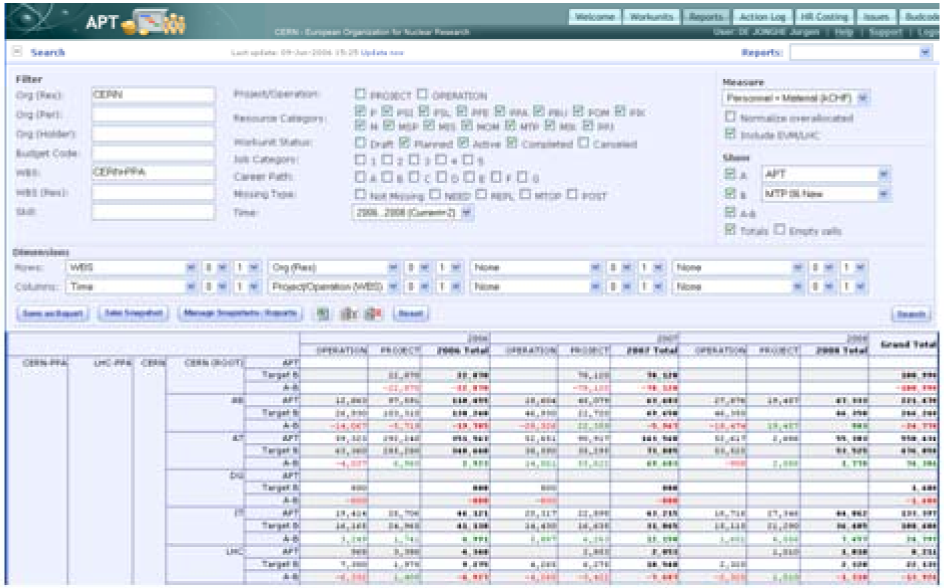
- **ILC Beam Delivery System cost estimate and back-up materials provided to CLIC at their request**

Cost Estimate Tool

For CLIC

Jurgen De Jonghe CERN / IT-AIS
jurgen.de.jonghe@cern.ch,

Dynamic Reports, multiple Breakdown Structures



Advantages / Disadvantages

Based on CLIC cost requirements and APT experience,
a proposal for a cost tool has been made

Questions: cost estimate tool as part of integrated tool, ICL/CLIC common tool?

- ✓ We have the experience of rolling out this kind of applications, we have the technology, we can reuse existing components. We do have to develop and apply these to the CLIC cost domain.
- ✓ We are in full control of the data, so we can export to another application later if needed.

- Not a standard, commercial-off-the-shelf tool.
- Further development may be required for risk analysis, what-if scenario's.
- We are overloaded and will need help with manpower.

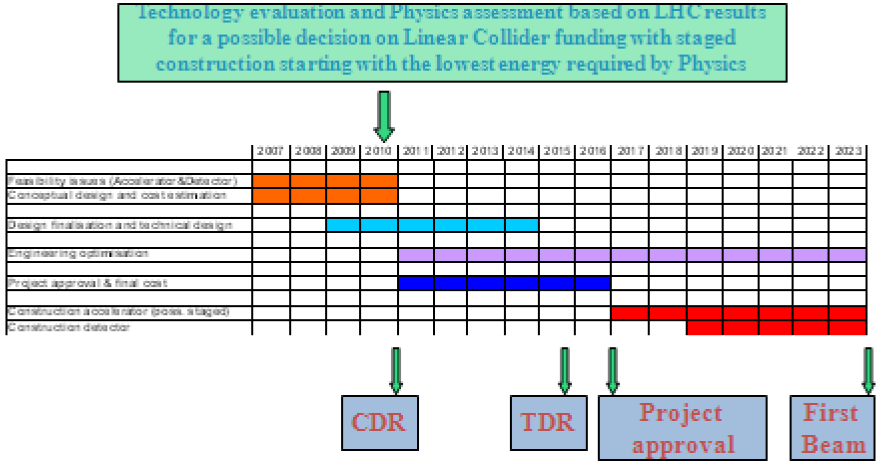
CLIC Schedule

« Time estimation based on LHC installation methods and experience »

Katy Foraz

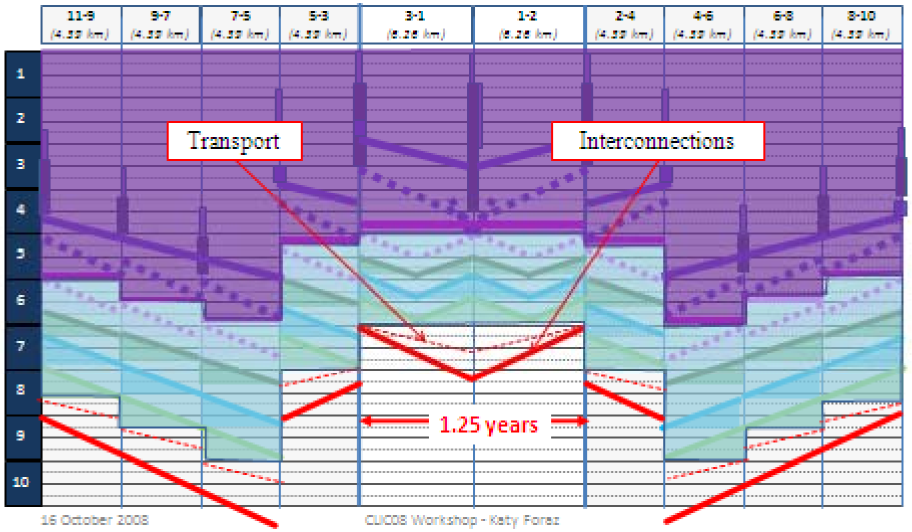
Tentative long-term CLIC scenario

Shortest, success oriented and technically limited schedule



Machine installation

Exercise for ML (2 TBM)



First draft for discussion:

7 y for 500 GeV ➔ ready for HW commissioning

+ 3 y for 3 TeV

Actions

Compare CLIC schedule assumptions with ILC assumptions .

Review ILC schedule with same CLIC assumptions