



Dubna GDE Workshop

ОИЯИ, Дубна, 04-06.06.2008

Marc Ross, Akira Yamamoto, Nick Walker
GDE Project Managers

Goals for 2008:

Cost and Risk reduction

SCRF

CERN engagement

R&D Plan

Consolidation of RDR cost estimate

To be reported LCWS 08 Chicago



Post RDR – ILC

- One year later:
- Focus on R&D →
 - **to mitigate technical risk**
 - (some of which assumed for RDR)
 - **to enable cost reduction**
- Managing the RDR
 - **held kick off meetings**
 - **working on consolidating cost information**
- Strengthening links with partners
 - **multi-lateral GDE**
 - **ca. 400 members**



Superconducting RF R&D

Three components to SCRF R&D:

1. Gradient (S0)

- **35 MV/m baseline cavity gradient**
- **should be able to build two x 11 km cold linacs with operational gradient 10% below this → realistically; practically**
- **Demonstrations underway!**

2. Plug Compatibility (includes S1)

– Purpose:

- Encourage innovation in R&D phase
- Motivate practical 'Project Implementation'

3. System Tests (S2)

- **show that the whole complex functions**



ILC SCRF R&D - 2008

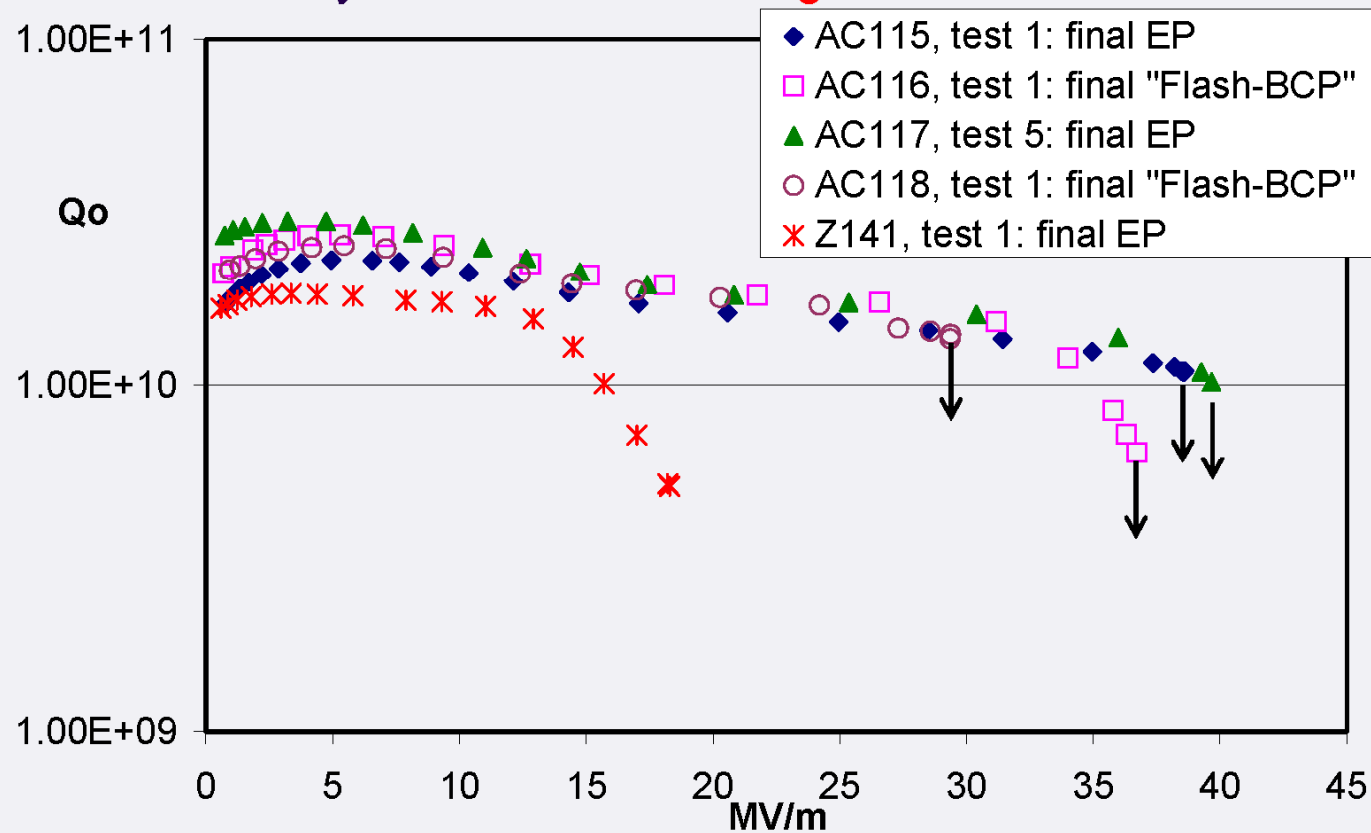
Where are we? What has been done in 2008?

Gradient (S0) **Cavity**

- 10.2007 :
 - results from 15 cavities (DESY - Zanon)
 - some cavities tested many times;
 - field emission reduced using ethanol rinse
 - Average 31.5 MV/m
- 06.2008 :
 - new batch of cavities (Accel) – 5 tested
 - industrial bulk electro-polish
 - first DESY - Accel results with ethanol rinse to suppress field emission
 - Accel Average: 36.2 MV/m
- 850 cavities to be ordered this year for XFEL / EU FP7
- additional optical inspection systems in fabrication

6th cavity production – rf results

- excellent + promising first results including first Plansee nine-cell (AC115)
- Z141 as first cavity with surfaces damages after fabrication under investigation





ILC SCRF R&D - 2008

- Plug Compatibility (included in S1) ***Cryomodule***
 - Progress toward consensus: due 2008
 - This is a real step toward ‘industrialization’ for a global ILC
- System Tests (S2) ***RF Unit***
 - Partly started with ‘FLASH / TTF, 9 mA test’
 - Full beam loading, high gradient (~ 30 MV/m avg)
March 2009



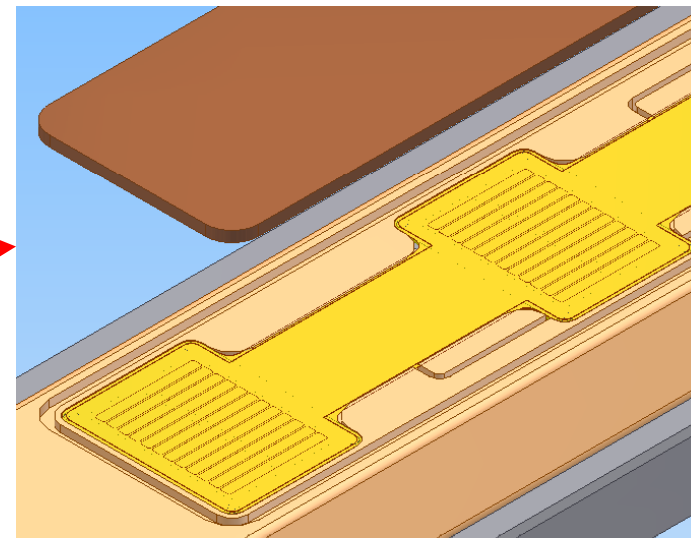
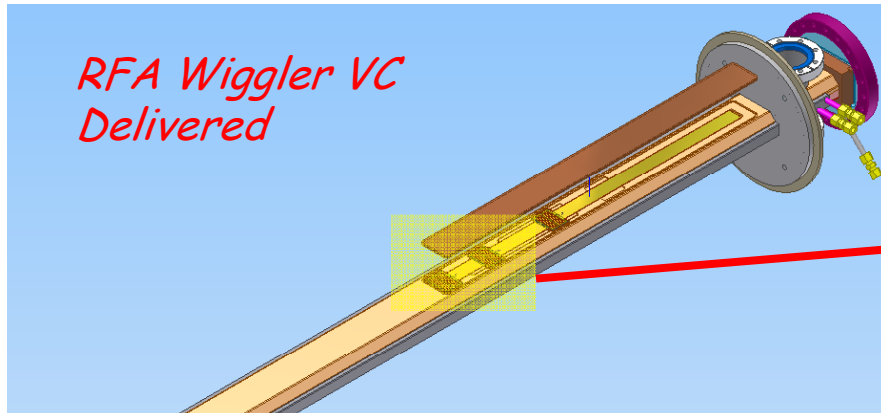
Accelerator Systems R &D: Beam Tests

- Damping Ring Beam dynamics – electron cloud
 - **CesrTA program moving forward →**
 - Thanks to strong KEK / NSF-DOE support
 - **beam tests now underway**
 - **First results LCWS 08 Chicago**
- Beam Delivery – Stabilization and Precision
 - **ATF2 International Collaboration**
 - **First beam October 2008**

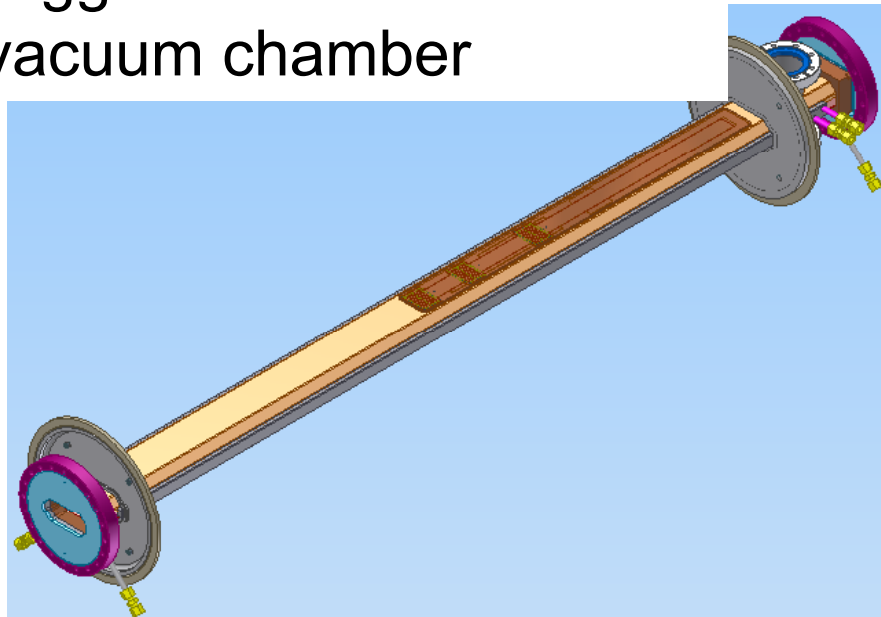


Chambers with Thin RFAs

*RFA Wiggler VC
Delivered*



CesrTA Superconducting
wiggler instrumented
vacuum chamber



- Loss of US collaborators impacted development heavily

- Cornell has picked up detailed design
- Now ready for final design review
- Construction now starting at LBNL as part of CU-KEK-LBNL-SLAC collaboration



cabling and piping, 14th May 2008



HA-PS installation, 14th May 2008

ATF2 - 2008



Laser hut construction(LW), 14th May 2008



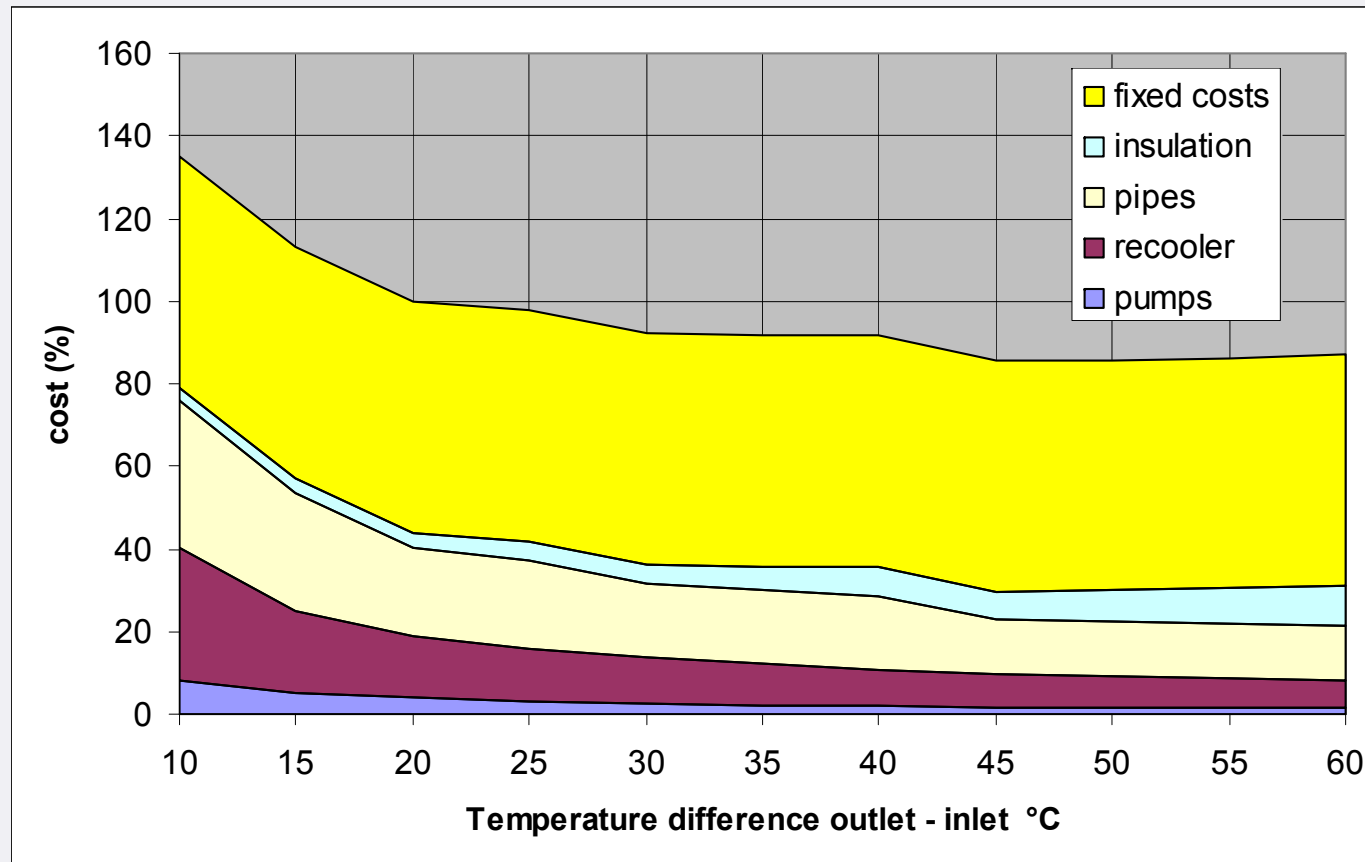
QBPM phase fine-adjustment, 21st May 2008



CFS Value Engineering

- RDR is our baseline
 - **strong, valid cost and design basis**
- the ‘uniform’ (*teamwork-based*) site development approach
 -
 - **working closely together /**
 - **consolidating resources**
- Specific FOCUS GROUP goals for this workshop:
 - A. **‘Quantify cost impact for near-surface scenarios’**
 - requirement matrix
 - B. **Develop ‘parametric models for infrastructure requirements’**
 - →

Cost cutting by increasing the temperature difference



Fixed costs:
chillers, pressed air,
water treatment,
auxiliary pipes, etc

recooler:
constant temperature
difference for the
heat flow at the cold
side (e.g. the air
temperature)

insulation:
always the same heat
flow

The outlet
temperature should
be less than 70°C:

Otherwise the water
will be too hot for
some equipments



CFS Value Engineering (2)

The purpose of this workshop

– (hence inter-group ‘focus groups’)

• The Dubna shallow site:

– subsurface ‘communication building’ cost 1/10
bored tunnel

– RDR WBS input from GSPI (ГСПИ) to be
provided

• Next step:

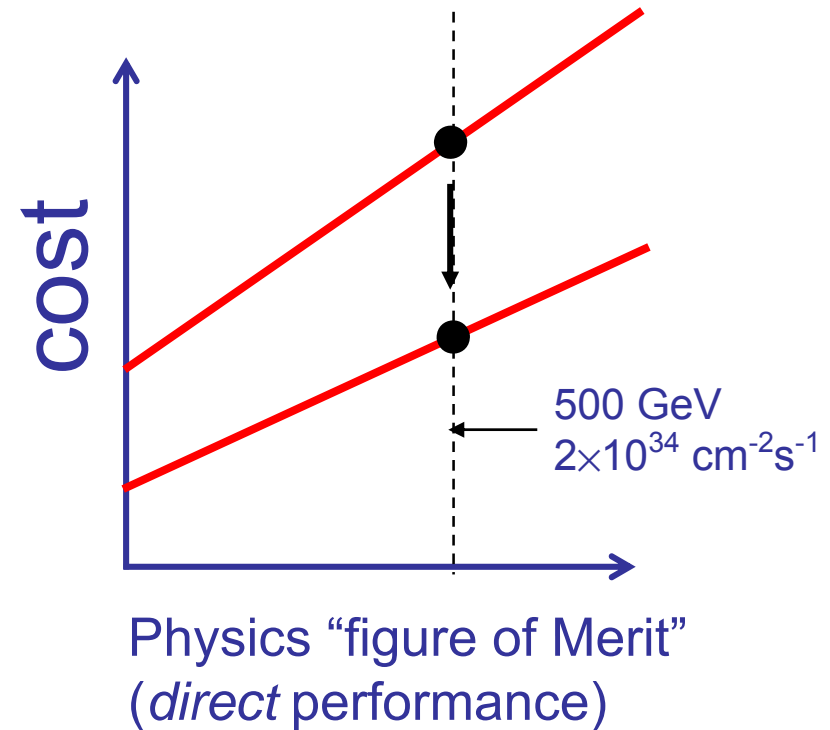
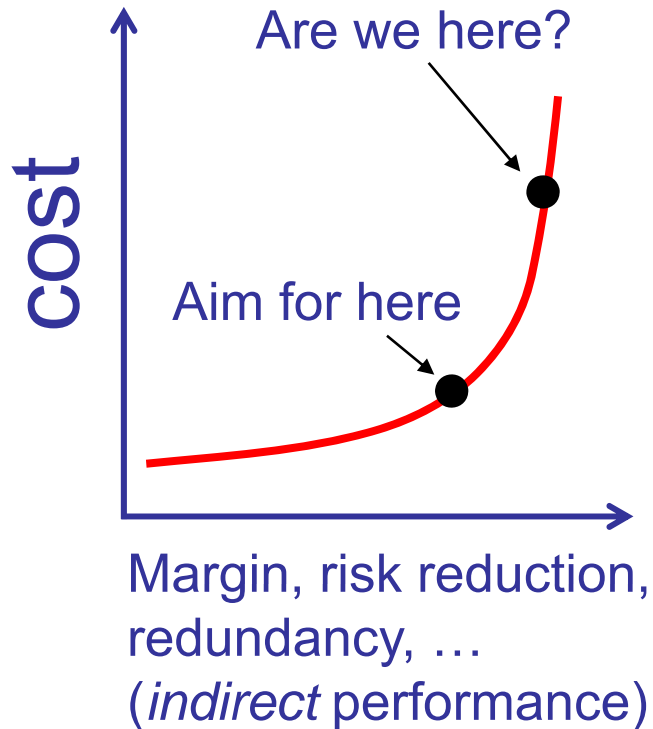
– **Joint Development of Dubna site:**

• GDE (EU), JINR, GSPI

– **How to take best advantage of special
features...**



The Minimum Machine Study



Minimum cost machine

Understand the performance derivatives



Towards a 'Minimum Machine' Configuration

- Working Groups:
 - C. **Siting**: Examine possible sites and evaluate possible design differences that accommodate features. Includes staging, design modifications and upgrade issues.
 - D. **Accelerator Systems**: particular focus on the central injection complex, BDS and RTML.
- Beginning of the process of:
 - Re-thinking the layout of the machine for a lower cost
 - Look for new and innovative ideas – particularly staging options
 - Defining the 'minimum machine' layout



Output of Workshop

- Significant potential identified:
 - **4-5 km tunnel and beamline**
 - **~100 MILCU for CFS**
 - **~100 MILCU for accelerator components**

} sets the typical scale of possible reduction
- All of the items discuss have associated impact on performance which will need to be quantified
 - **Action items for LCWS**
 - CMG and relevant TAG leaders



Milestone – Dubna GDE meeting:

- Release of the ILC Technical Design Phase R & D Plan
 - today
- The plan includes an outline of our
 - strategy
 - work plan
 - schedule
 - deliverables
 - resources
 - constituency
- very useful for management, reviews, funding agencies, ...



R&D Plan Release 2



- Look! NO DRAFT!
- Released today
- Next review and release:
December 08



PM TD Phase 1 & 2 Schedule

calendar year	2008	2009	2010	2011	2012
Tech. Design Phase I	[Blue bars]				
Tech. Design Phase II	[Blue bars]				
Siting	[Red bars]				
Shallow site option impact studies	[Red bars]				
Definition of uniform site specs.	[Red bars]				
Collider Design Work	[Red bars]				
Definition of minimum machine	[Red bars]				
Minimum machine & cost-reduction studies	[Red bars]				
Review TDP-II baseline	[Red bars]				
Publish TDP-I interim report	[Red bars]				
Prepare technical specifications	[Red bars]				
Technical design work	[Red bars]				
Generate cost & schedule	[Red bars]				
Internal cost review	[Red bars]				
Design and cost iteration	[Red bars]				
Technical Design Report	[Red bars]				
Cost & Schedule Report	[Red bars]				
Project Implementation Plan Report	[Red bars]				
Publication final GDE documentation & submit for project approval	[Red bar]				
Project Implementation Plan	[Blue bars]				
Review and define elements of PIP	[Blue bars]				
Develop mass-production scenarios (models)	[Blue bars]				
Develop detailed cost models	[Blue bars]				
Develop remainder of elements	[Blue bars]				
SCRF Critical R&D	[Green bars]				
CM Plug compatibility interface specifications	[Green bars]				
S0 50% yield at 35 MV/m	[Green bars]				
S0 90% yield at 35 MV/m	[Green bars]				
Re-evaluate choice of baseline gradient	[Green bars]				
S1-Global (31.5MV/m cryomodule @ KEK)	[Green bars]				
S2 RF unit test at KEK	[Green bars]				
S1 demonstration (FNAL)	[Green bars]				
S2 RF unit at FNAL	[Green bars]				
9mA full-beam loading at TTF/FLASH (DESY)	[Green bars]				
Demonstration of Marx modulator	[Green bars]				
Demonstration of cost-reduced RF distribution	[Green bars]				
Other critical R&D	[Light blue bars]				
DR CesiTA program (electron-cloud)	[Light blue bars]				
DR fast-kicker demonstration	[Light blue bars]				
BDS ATF-2 demagnification demonstration	[Light blue bars]				
BDS ATF-2 stability (FD) demonstration	[Light blue bars]				
Electron source cathode charge limit demonstration	[Light blue bars]				
Positron source undulator prototype	[Light blue bars]				
Positron source capture device feasibility studies	[Light blue bars]				
RTML (bunch compressor) phase stability demo	[Light blue bars]				

A tentative top-level management plan for TD Phase 1 & 2 now exists

- Published in R&D Plan
- More detailed schedule being updated
 - MS Project

Part of release 2

Encapsulates the PMs strategy and vision for the next four years

- Critical R&D
- Cost reduction / machine design
- Project Implementation Plan

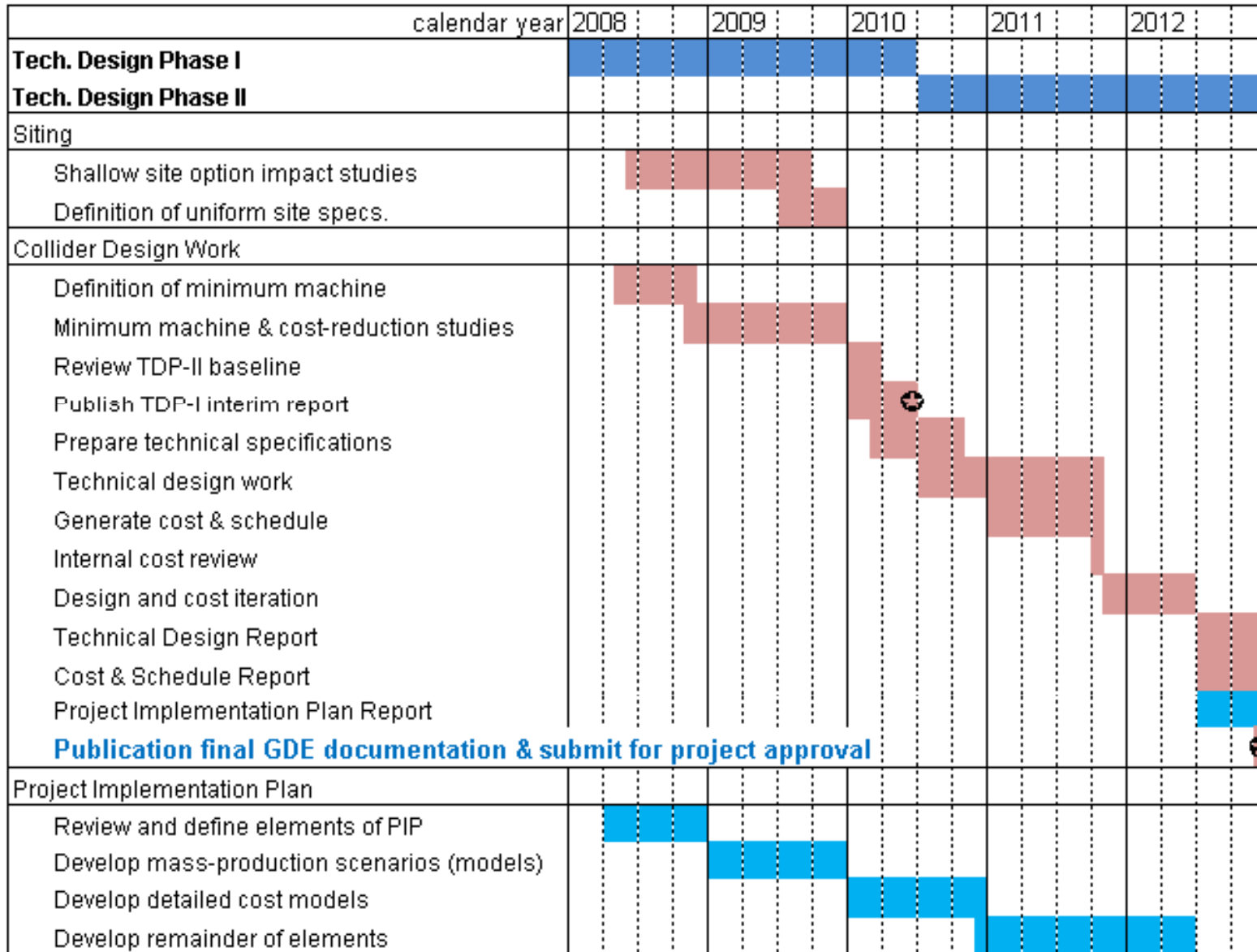


Critical R&D

calendar year	2008	2009	2010	2011	2012
Tech. Design Phase I	[Blue bar spanning 2008-2010]				
Tech. Design Phase II	[Blue bar spanning 2010-2012]				
SCRF Critical R&D					
CM Plug compatibility interface specifications	[Green bar spanning 2008-2010]				
S0 50% yield at 35 MV/m	[Green bar spanning 2008-2010]				
S0 90% yield at 35 MV/m	[Green bar spanning 2008-2012]				
Re-evaluate choice of baseline gradient	[Green bar spanning 2008-2010]				
S1-Global (31.5MV/m cryomodule @ KEK)	[Green bar spanning 2009-2011]				
S2 RF unit test at KEK	[Green bar spanning 2010-2012]				
S1 demonstration (FNAL)	[Green bar spanning 2009-2011]				
S2 RF unit at FNAL	[Green bar spanning 2010-2012]				
9mA full-beam loading at TTF/FLASH (DESY)	[Green bar spanning 2008-2010]				
Demonstration of Marx modulator	[Green bar spanning 2008-2010]				
Demonstration of cost-reduced RF distribution	[Green bar spanning 2008-2010]				
Other critical R&D					
DR CsrTA program (electron-cloud)	[Light blue bar spanning 2008-2010]				
DR fast-kicker demonstration	[Light blue bar spanning 2008-2010]				
BDS ATF-2 demagnification demonstration	[Light blue bar spanning 2008-2010]				
BDS ATF-2 stability (FD) demonstration	[Light blue bar spanning 2010-2012]				
Electron source cathode charge limit demonstration	[Light blue bar spanning 2008-2010]				
Positron source undulator prototype	[Light blue bar spanning 2008-2010]				
Positron source capture device feasibility studies	[Light blue bar spanning 2008-2010]				
RTML (bunch compressor) phase stability demo	[Light blue bar spanning 2008-2010]				



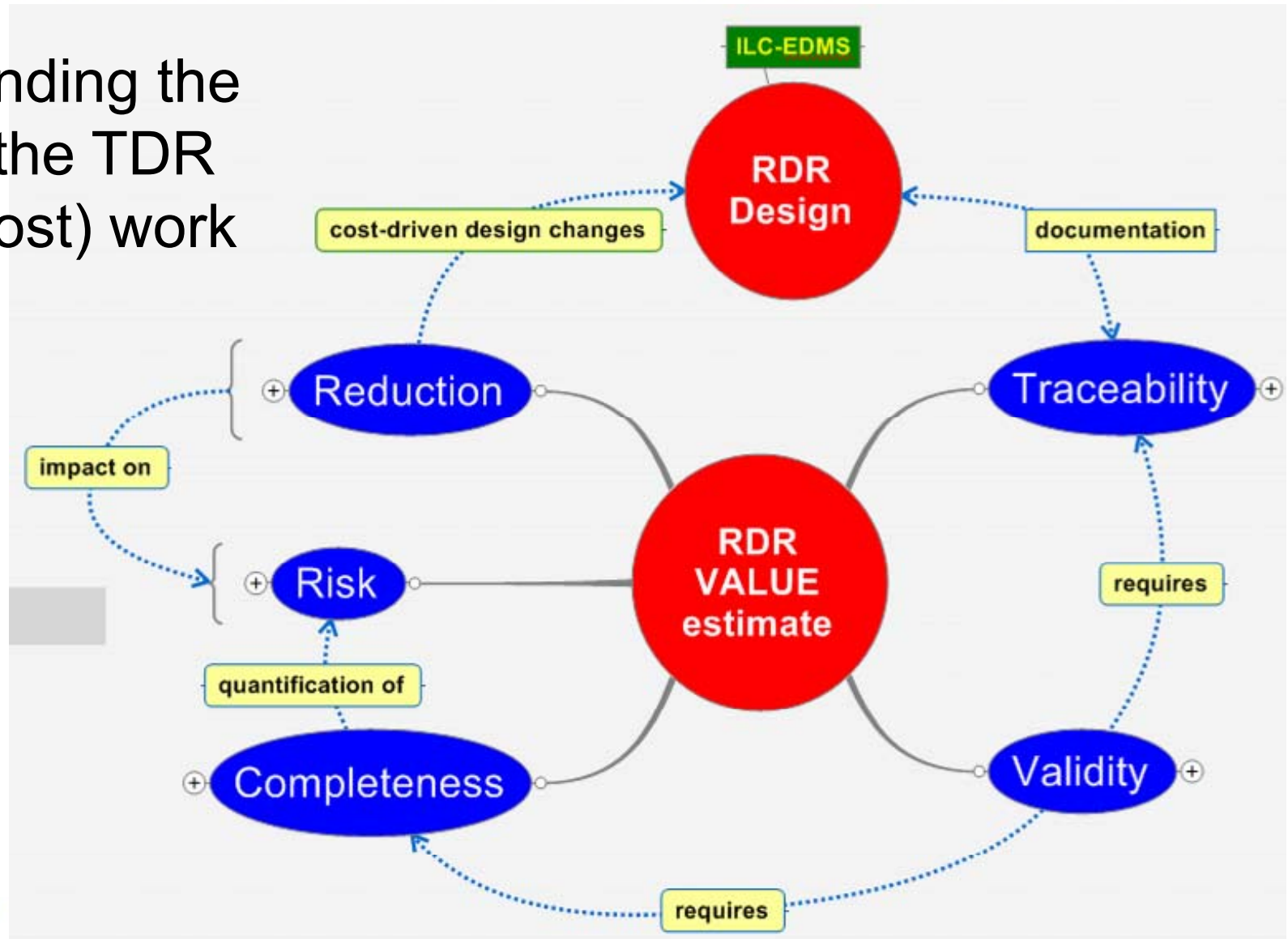
Design / Cost Reduction / PIP





THE RDR LIVES ON !

Understanding the scope of the TDR (design/cost) work





How Good is the RDR Concept?

- The design has been carried out by Area Systems that have been built up into an overall design.
 - We have advanced in integrating that design and even in being able to evaluate proposed changes that cross several area systems (e.g. central injector – E Paterson)
 - A more integrated design approach is envisioned for the engineering design stage.
- Technical system designs still immature, resulting in lack of detailed specifications, requirements and value engineering has been deferred



CLIC-ILC Cost & Schedule Group Summary, future tasks

- **Two specific topics for collaboration: progress to be reported on at the CLIC workshop in October...**
- 1. Defining common templates that will be gathered and/or used to catalog cost estimates from the technical groups
 - **Timely, since both groups are in the process of developing such templates.**
 - **Could allow use of common analysis and reporting tools**
 - **Strongly linked with cost management processes and tools**
- 2. Defining cost management processes and associated tools
 - **Requires consideration of how the cost estimate data will be used: report generation, analyses, trade studies, etc**
 - **The CLIC group will be invited to participate in discussions on requirements for consultancy**
 - **Has a short timeframe for the ILC group since we are in the process of engaging a consultancy to support developing of cost management tools.**
- General comment: both groups are interested in learning from each other. Additional topics that came up during discussions include:
 - **Structuring and organizing cost estimate information and bases of estimates**
 - **Handling uncertainty and risk in the cost estimates**



GDE Meetings:

you requested:

- fewer meetings: 3 down to 2.
 - **One ‘collaboration-wide’ → LCWS 08 Chicago**
 - broad attendance and comprehensive program, please!
 - structure based on our Technical Area Groups
 - **One thematic (this is the first)**
 - **Proposed for early 2009:**
 - AAP Review – 3 days, plenary 2 days
- advance planning
 - **Conveners, focus / working groups**



Homework for LCWS 08 Chicago:

based on Dubna priorities:

- CFS / Accelerator Design updates
 - **Cost reduction**
- CFS change requests
 - **complete Value Engineering cycle started here**
- Collaboration work and reports (e.g. CLIC – ILC)
- R & D Plan updates
 - **trade offs developed here**
 - **(the basis of value engineering is cost/performance trade off)**



To our JINR Hosts:

- Позвольте выразить Вам от всего сердца бесконечную благодарность за проведение Совещания, за отличную организацию, гостеприимство и заботу!
- Спасибо!
- Thank you!
- Excellent hospitality! Excellent organization!
- Beautiful surroundings, excellent location, excellent logistics, etc!