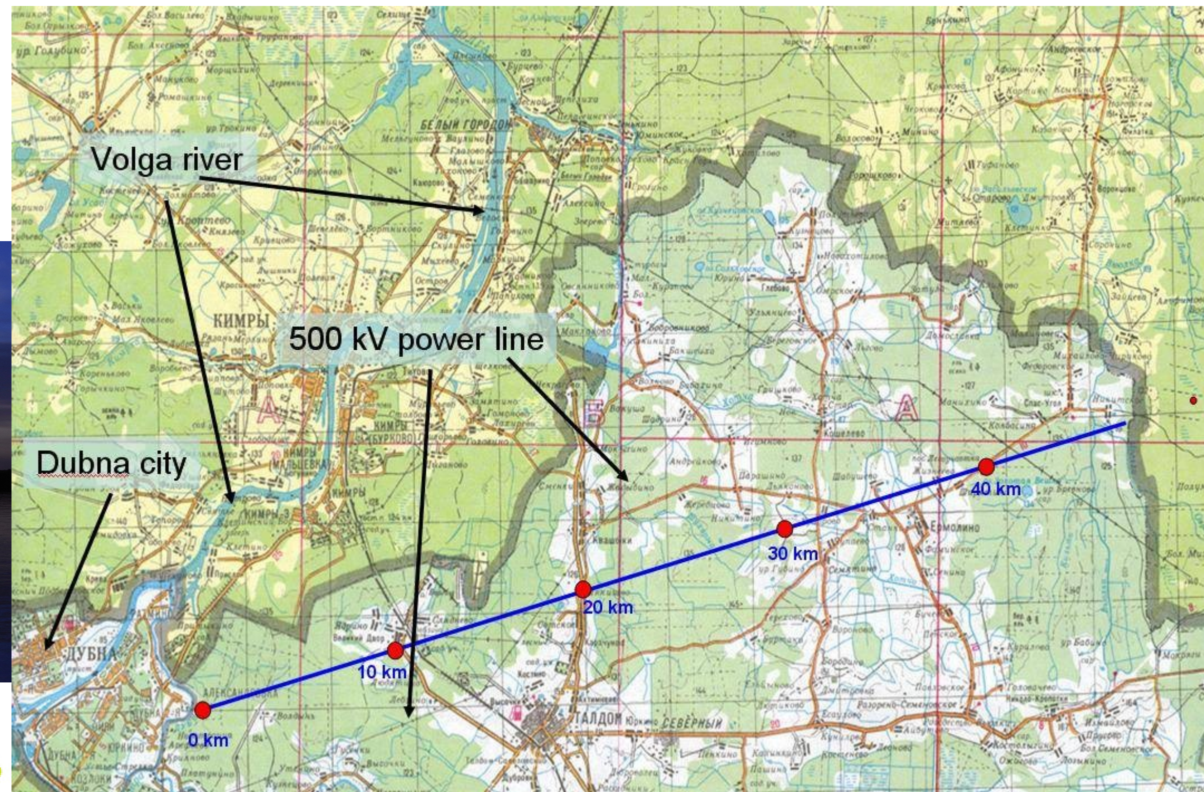
Report of Dubna GDE

Masao KURIKI
Hiroshima/KEK

Dubna GDE

- June 4-6, Dubna, Moscow region, Russia
- DUBNA: JINR (Joint Institute for Nuclear Research).
- It was a thematic GDE meeting focused on site and CFS.



Post RDR – ILC
(Dubna GDE closing by M. Ross)

- 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**

R&D Plan Release 2

ILC Research and Development Plan for the Technical Design Phase

Release 2

June 2008

ILC Global Design Effort

Director: Barry Barish

Prepared by the Technical Design Phase Project Management

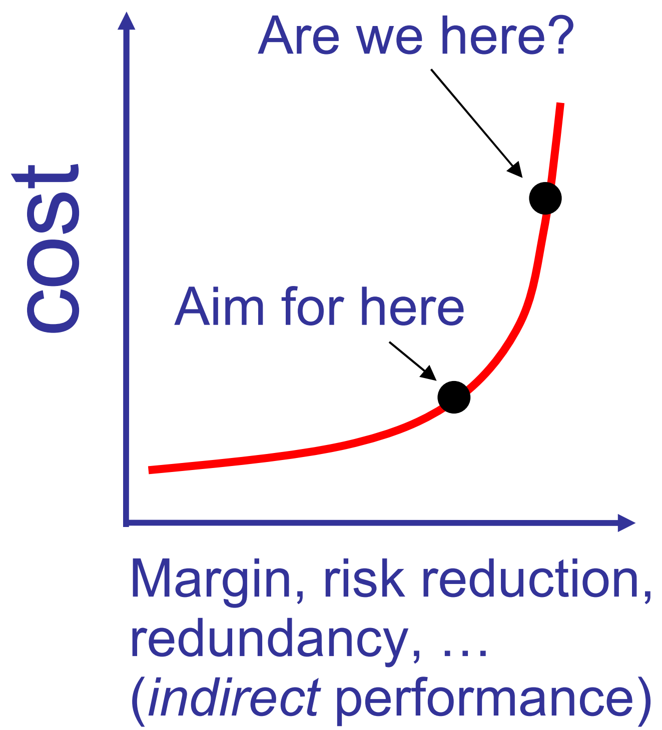
Project Managers: Marc Ross, Nick Walker, Akira Yamamoto

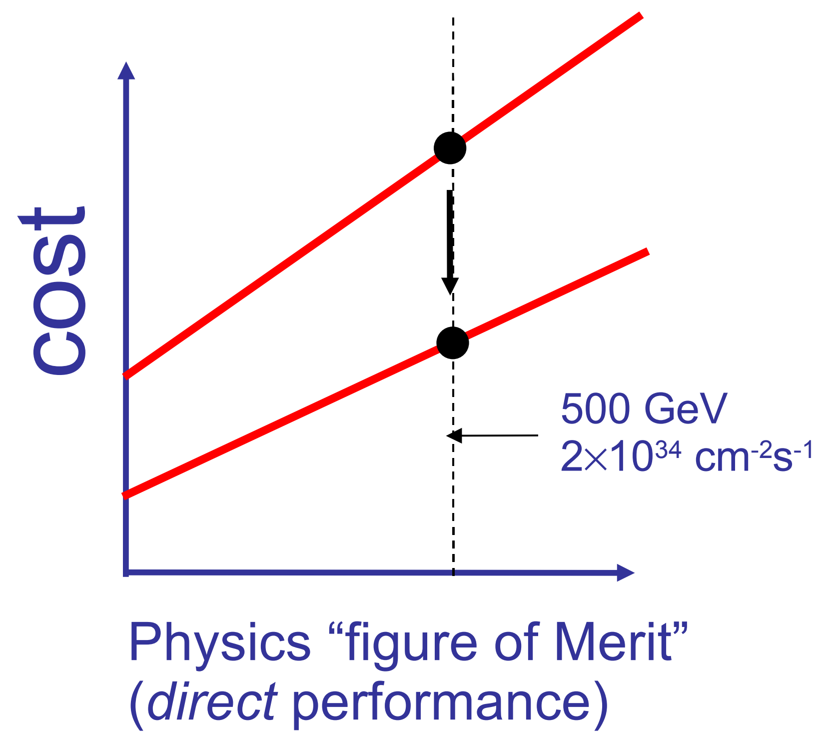
- Look! NO DRAFT!
- Released today
- Next review and release: December 08

Towards a 'Minimum Machine' Configuration

- Working Groups:
  - **Siting: Examine possible sites and evaluate possible design differences that accommodate features. Includes staging, design modifications and upgrade issues.**
  - **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**

The Minimum Machine Study





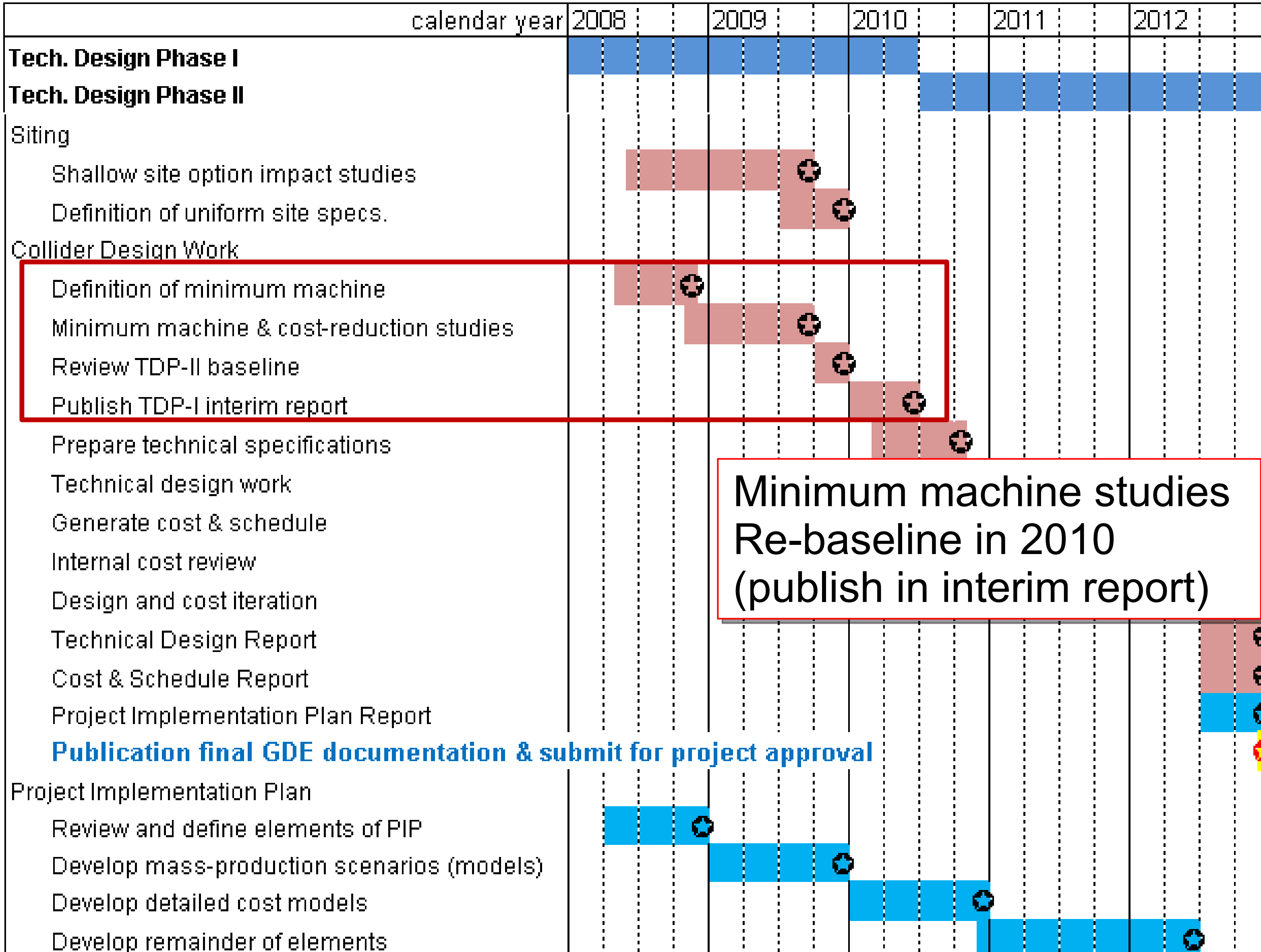
Minimum cost machine

Understand the performance derivatives

What is the mile-stone?

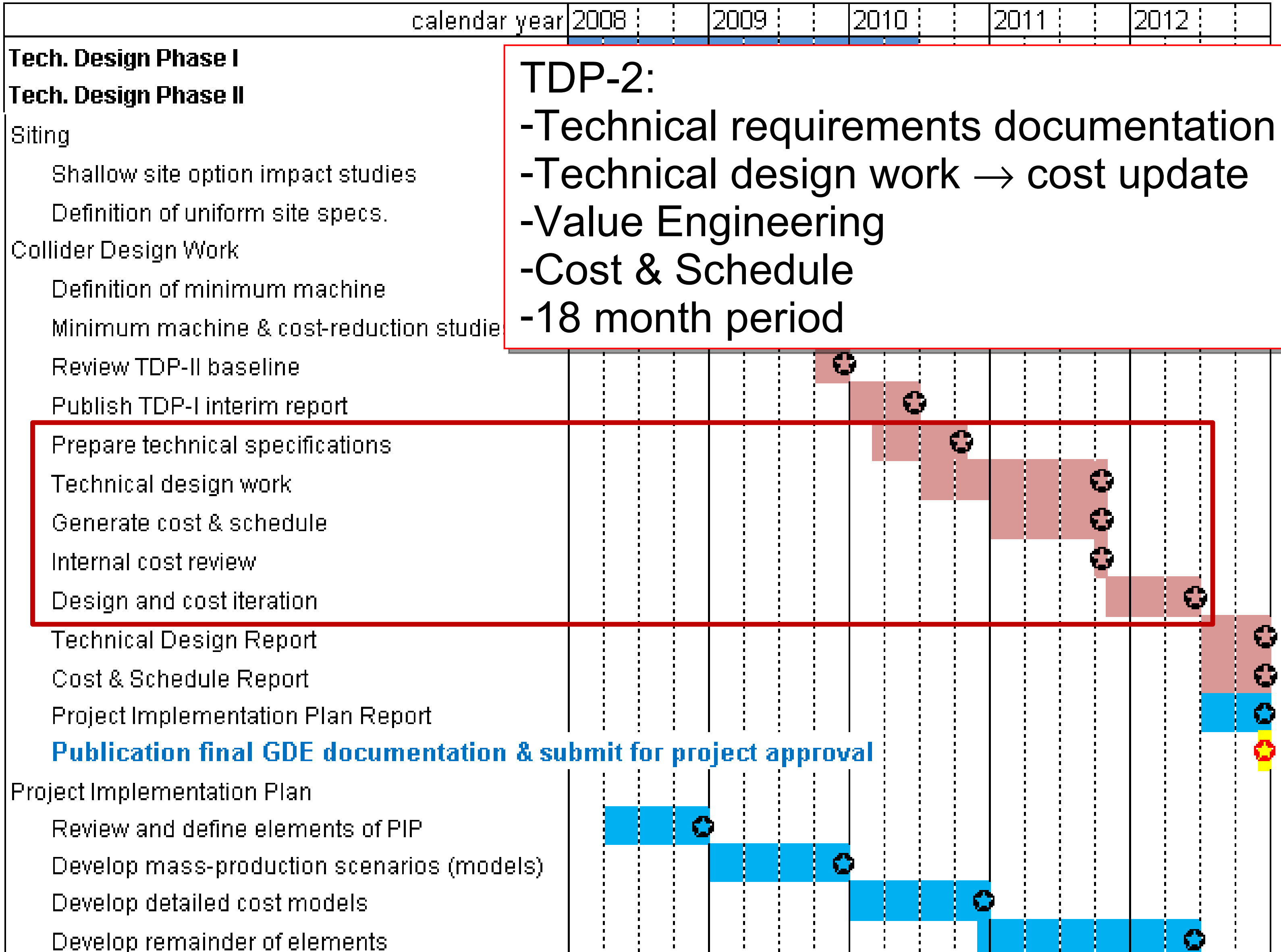
- TDP-1 is focused on
  - **Risk mitigation**
  - **Cost reduction**
- Produce a new baseline for the conceptual machine design, in preparation for more detailed technical design work in TDP-2.
- The re-baseline will take place after careful consideration and review of the results of the TDP-1 studies and the status of the critical R&D.

TDP-1 (by N. Walker for PM team)

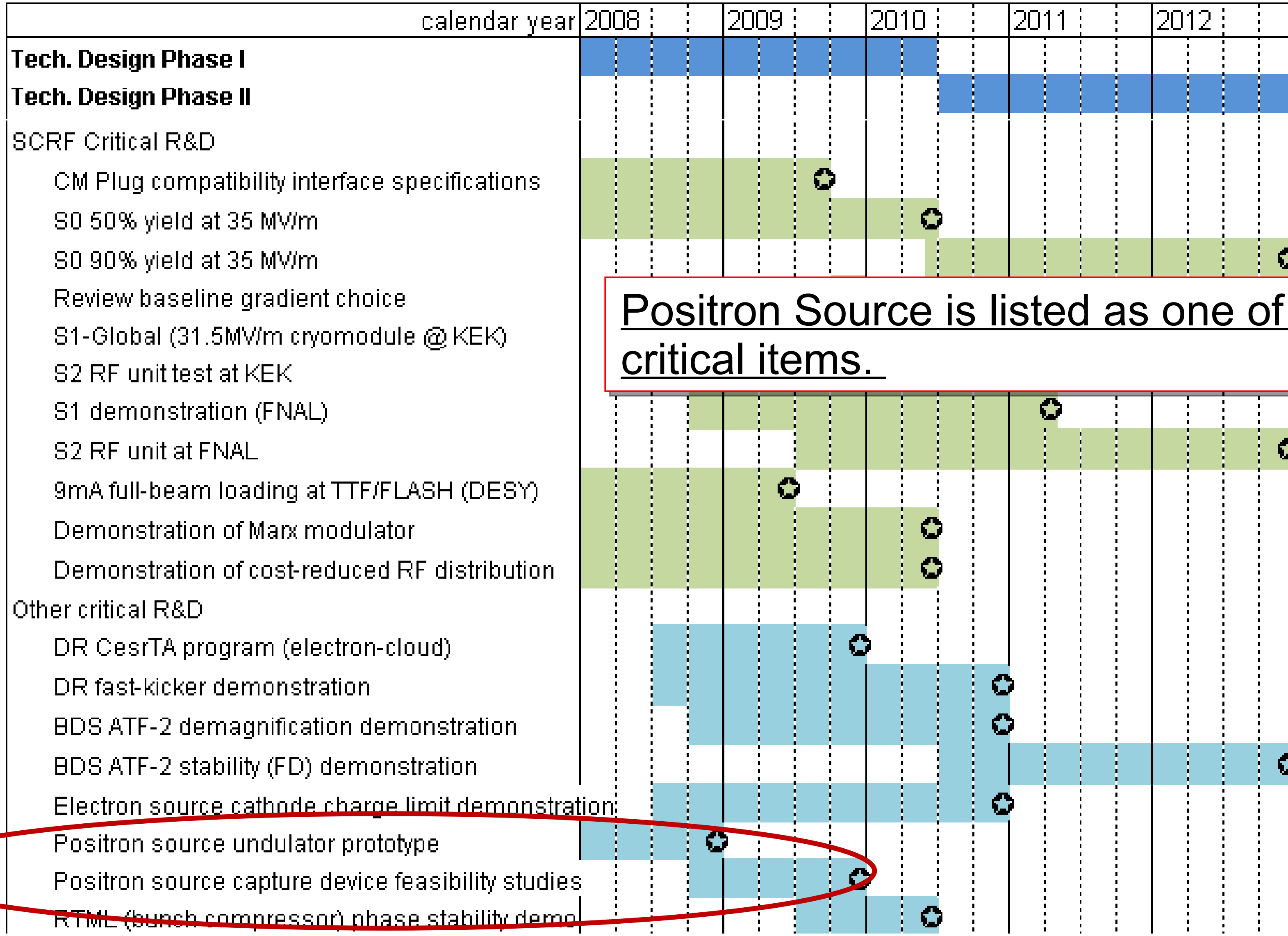


TDP-2

TDP-2:
- -Technical requirements documentation
- -Technical design work → cost update
- -Value Engineering
- -Cost & Schedule
- -18 month period



Critical R&D

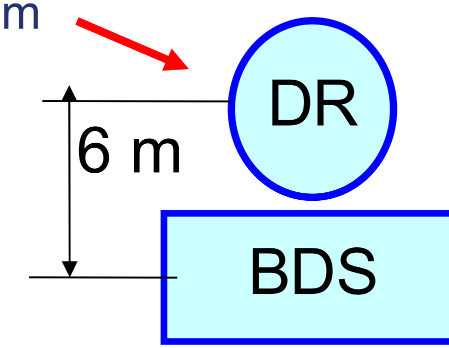


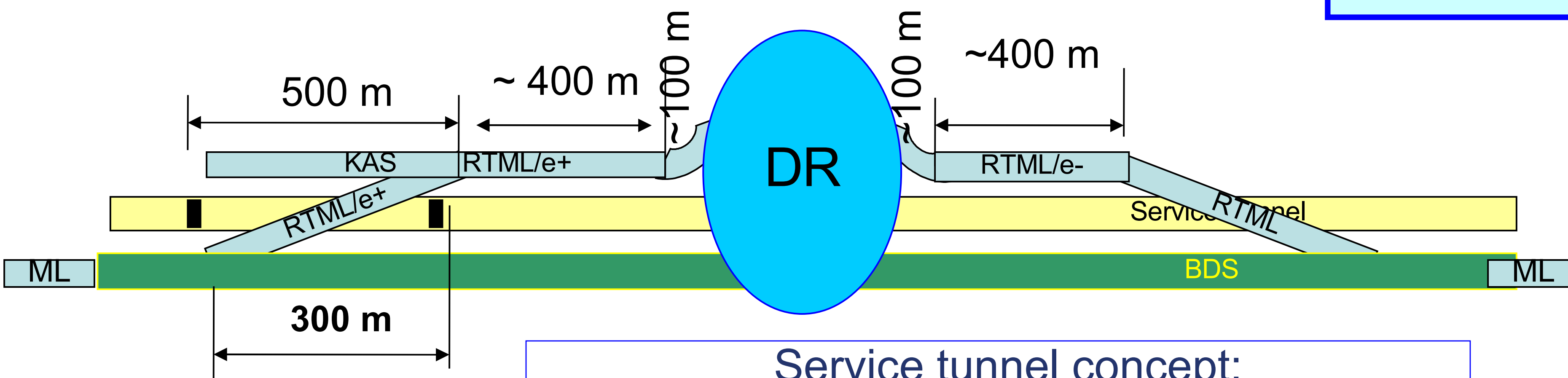
Positron Source is listed as one of the critical items.

Possible configuration of the RTML/source tunnels

Minimum length of the separate RTML/source tunnel

- Smaller vertical separation of DR and BDS tunnels: 10m -> 6 m
- Length constraints:
  - Electron source side (straight) ~ 500 m
  - Positron source: 950m =500m(KAS)+450m (SCL/TRL)
- Min RTML tunnel length here ~ 800 m (now ~1250 m)





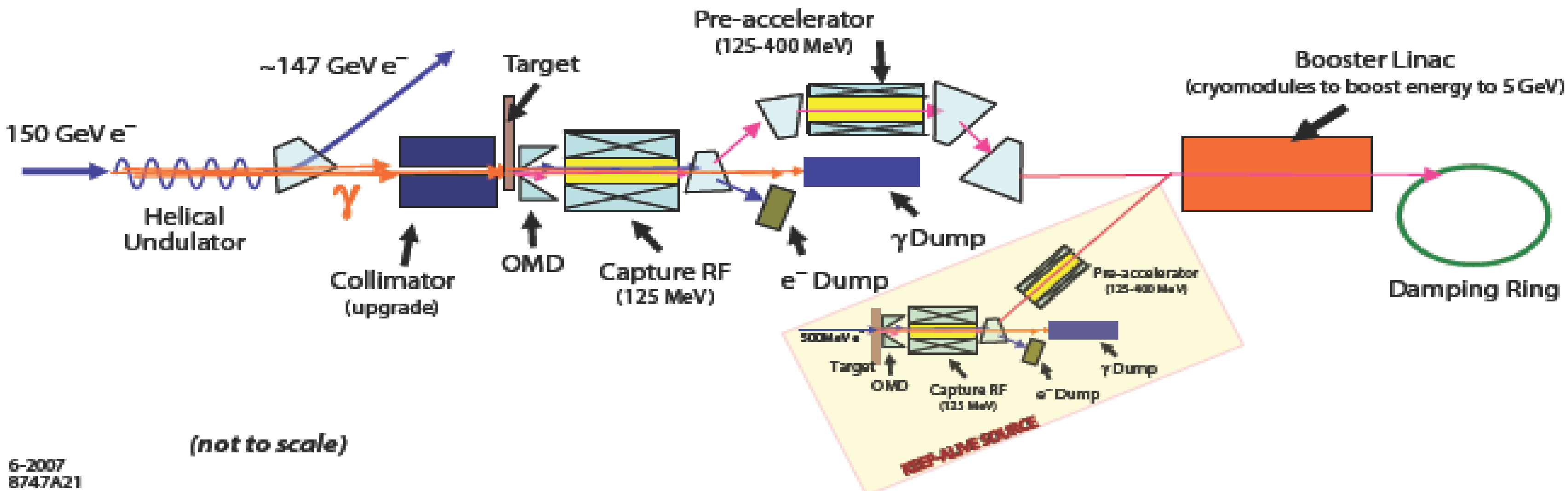
Service tunnel concept:

- Straight good for TBM technology
- RTML tunnel crosses service tuning
- Radiation issues ???

Consider E+ Source Layout (by E. Patterson)

- Lengths of the RDR e+ systems in meters

Undulator	**Drift&Dogleg**	Target+ Capture	Pre-accelerator	TOTAL
100(200)	**400**	100	500	1200



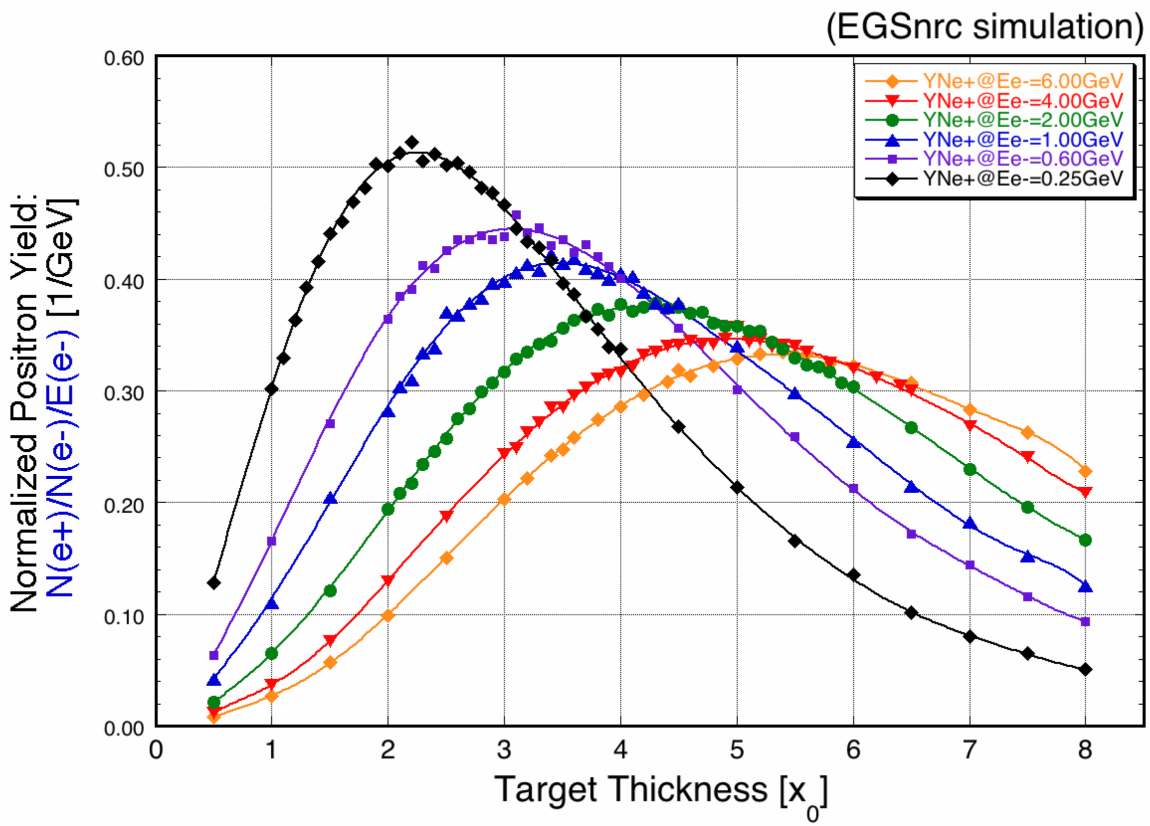
Q? Can we insert a warm 400 MeV E- accelerator in the drift/dogleg section and use the same target/capture, preaccelerator as a new type of "*KAS*" YES, WHY NOT?

KAS or *KAS (by E. Patterson)*

- We need to review the design ***requirements*** for a KAS and its cost/benefits to overall ILC operation.
- RDR design has everything (except polarization) at 10% intensity…Injector, L-band linac, tgt/capture section and pre-accelerator. *Large and expensive!*
- An extreme alternate ***KAS*** could be a compact S-band single bunch linac whose e- beam uses the photon E+ tgt, capture and pre-accelerator, producing single bunches at a few % intensity.
- *Inexpensive, compact and could fit between the undulator and target alongside the photon and high energy e beam!*

What is KAS or *KAS* (by M. Kuriki)

- 600 MeV driver with $0.4X_0$ target makes ~3% intensity.
- The same driver with $3X_0$ target makes >20% intensity.
- $0.4X_0$ Ti alloy and $4X_0$ W has same thickness, which can be replaced.



KAS

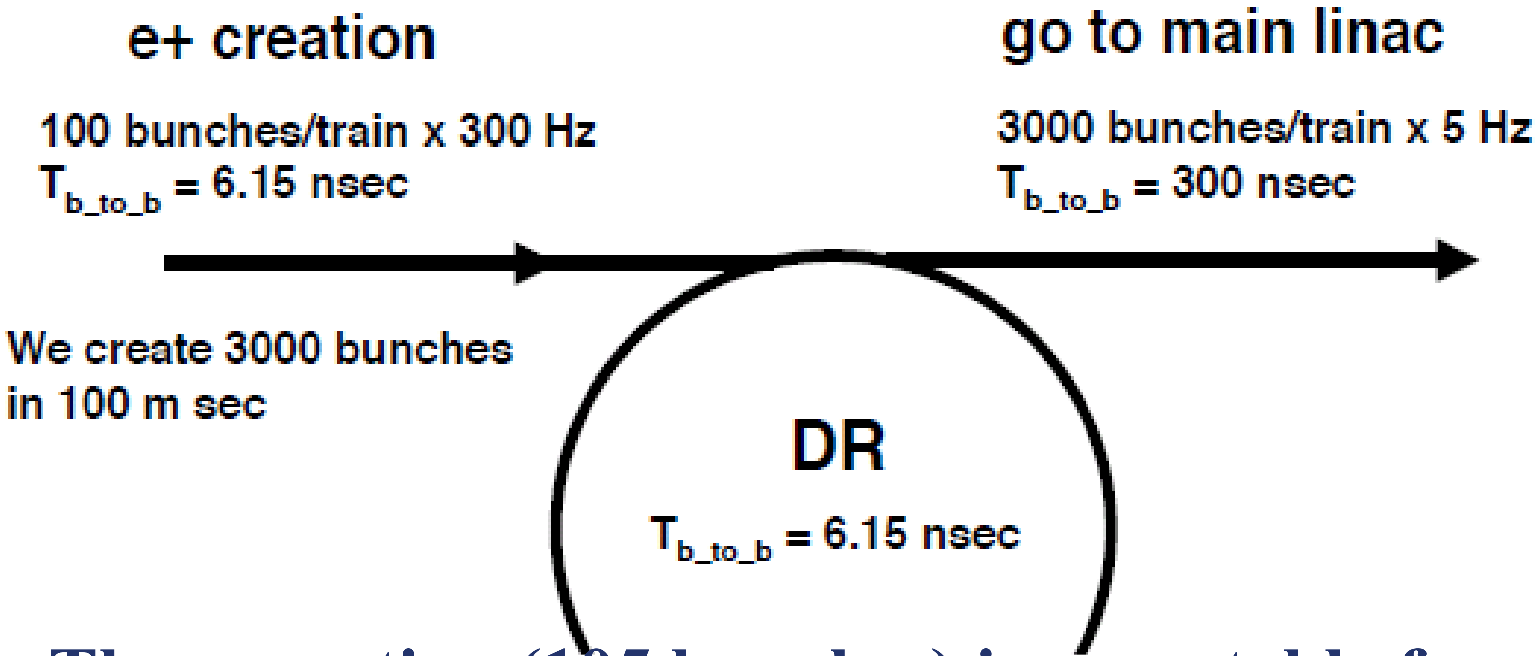
- Start up e+ source is very important in MD phase.
- In the initial phase, $3X_0$ W-Re instead of $0.4X_0$ Ti alloy improves the e+ intensity.
  - 600 MeV single bunch S-band accelerator (30m) can generate >20 % intensity e+ beam.
- This single bunch can be accumulated in DR forming the ILC format beam with 20% bunch charge.
- This beam is more useful for commissioning.
- The target can be replaced when undulator e+ is ready for the commissioning. KAS becomes a small backup with a few % intensity.

KAS

- 400m drift space is enough to accommodate 6 GeV e- linac.
  - It could be driver linac for conventional e+ source with the full intensity.
  - It also compatible to Linac based laser compton e+ source.
- Tunnel for undulator section is therefore compatible to all schemes which we have considered. Even after completion of tunnel, we can switch e+ scheme among them.
- Because of this flexibility, this approach (KAs or KAS) minimizes unexpected risks.

e+ source with Liquid Lead Target

J. Urakawa



- **The operation (105 bunches) is acceptable for BN window.**
- **Lead move 32 mm in 3.3 ms pulse interval, then the heat is removed (Speed of lead = 10 m/sec)**
- **It takes 83 ms (25 pulses) to generate 2625 e+ bunches. 117 ms is for damping.**

BINP activity in Liq Pb target and Matching Device

- 20000 h of liquid lead contour successful run with cog-wheel pump has been reached (90% Pb, 10% (mass)Sn alloy, 300ºC).
- The test of window braising technology successfully finished.
- The prototype of liquid lead positron production target is under commissioning now.
- The successful test of VEPP-5 positron production system was performed. Flux Concentrator magnet (FC) was tested up to 70 kG (30 μs pulse duration) without saturation in positron yield.
- The investigation of the technical limit for maximum FC pulse duration is in progress.
- Flat face FC for 30 μs pulse duration, 10 T maximum field and good field quality for KEKB is under the tests now at BINP.

Summary

- TDP is now activated.
  - Re-baseline for risk mitigation and cost-reduction are central issues for TDP-1.
  - TDP-2 is technical design phase based on the re-baselined design.
- Our task is brushing up our design to minimize the risk and cost.
- Discussion for minimum machine has been started in Dubna-GDE.
  - To be continued.