

Report from the Accelerator Design & Integration Meeting at DESY

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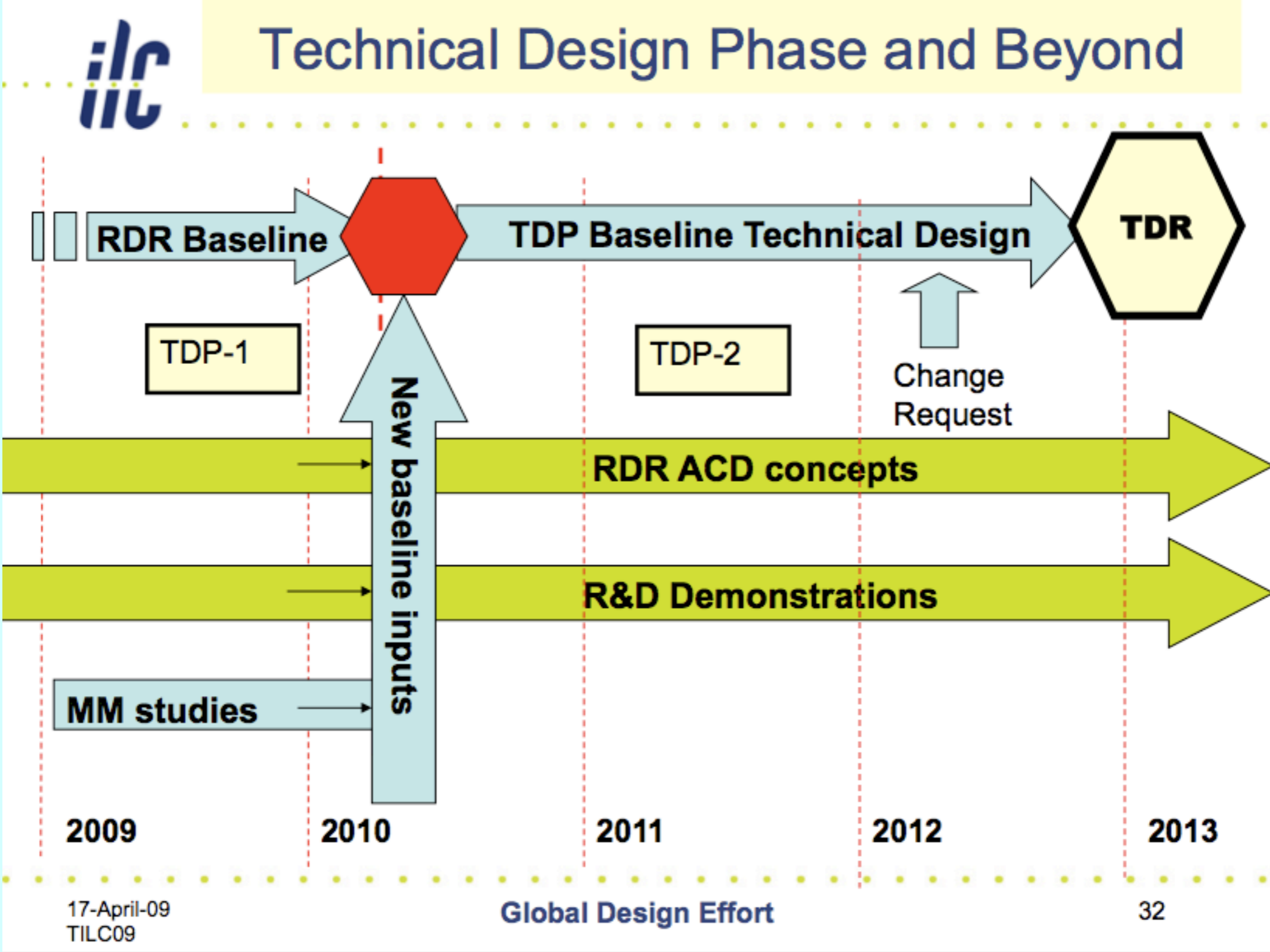


MDI-D Webex Meeting
12 June 2009

Accelerator Design and Integration Meeting

- At DESY May 28/29 2009
- First of a series of re-baselining meetings of the GDE
- Research Director asked Phil and myself to participate as official observers of the Physics and Detector Organisation

<http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=3526>





Updated Baseline Design

- **Will reflect choice of new baseline at end of TDP1**
 - Layout, integration, gradient etc.
 - Cost-driven
- **Level of detail not expected to be beyond RDR**
 - Unlikely to have “detailed engineering” resources available
- **Better documentation (than for RDR)**
 - Structured documents → traceability
 - Use of 3D CAD (“Visualisation”)
 - ILC-EDMS
 - Link to TRIAD and ICET (cost)
- **More structured project management providing leadership**
 - Of design decisions
 - Of cost estimates

More time than RDR
(2 years)

Tools & methodology
being developed now
(TDP1)



Preparing a Proposal 1/2

- **Started with MM document (cost reduction)**
 - Basically a result of discussions at Dubna June 08
- **Formal preparation begins here at this meeting**
 - This meeting is fundamentally a scope and planning meeting
- **Concluding discussions for proposal: ALCPG**
(Sept/Oct 09)
 - Conclusion of process begun at this meeting
 - Final consensus (of this group) on scope and structure of Proposal Document



Preparing a Proposal 2/2

- **Formal document end 2010 (Draft)**
 - October-December for writing
- **Review and acceptance process**
 - Initial review by AAP January
 - Release to broader community
 - Feedback / Discussion
 - Final “Acceptance Process” TBD
- **This group is responsible for producing the new ILC design**
 - Ownership during TDP-2



SB-2009 Proposal (PMs)

1. A Main Linac length consistent with an optimal choice of average accelerating gradient
 - RDR: 31.5 MV/m, to be re-evaluated
2. Single-tunnel solution for the Main Linacs and RTML, with two possible variants for the HLRF
 - Klystron cluster scheme
 - DRFS scheme
3. Undulator-based e^+ source located at the end of the electron Main Linac (250 GeV)
 - Capture device: Quarter-wave transformer

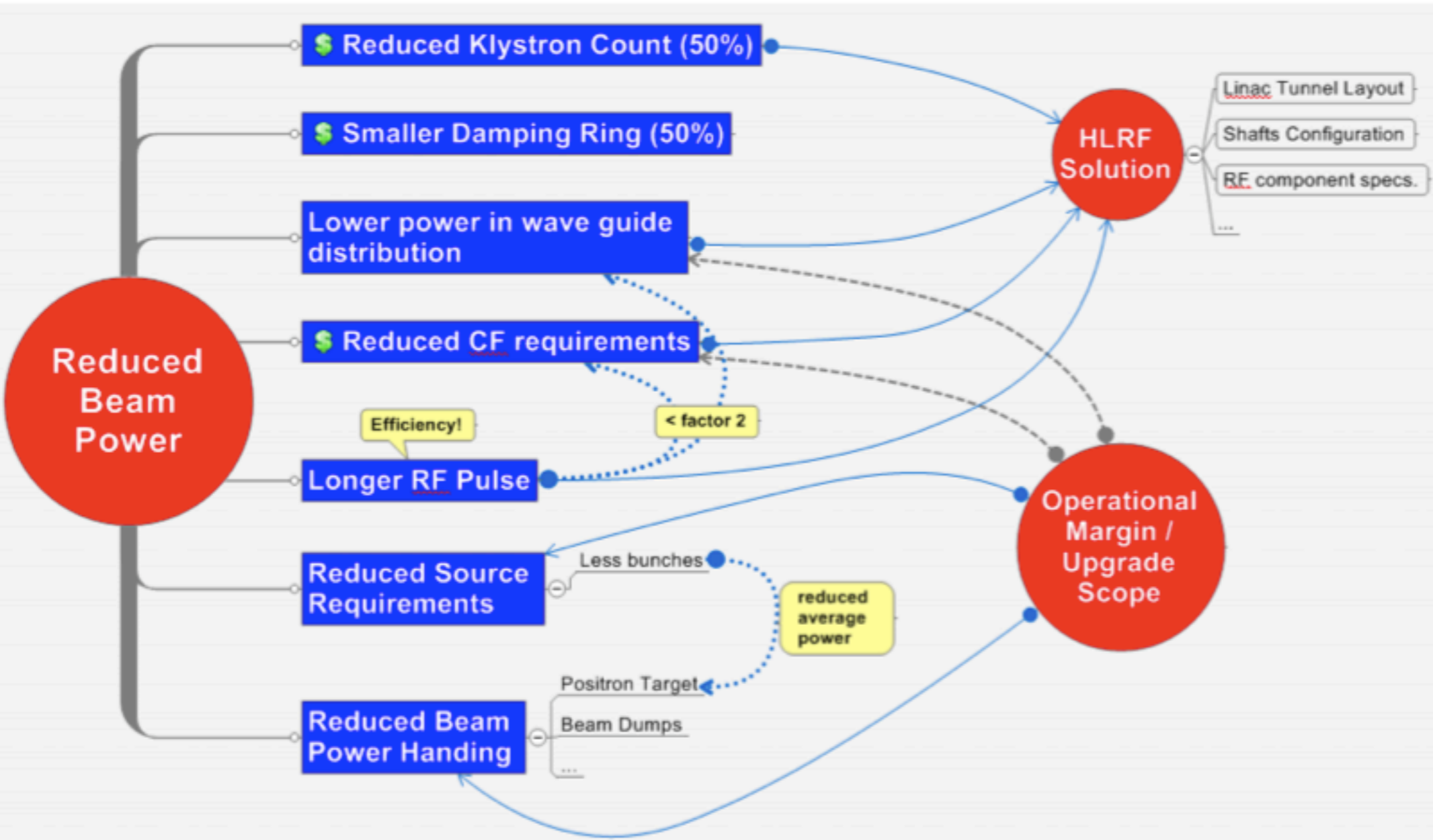


SB-2009 Proposal (PMs)

4. Reduced parameter set (with respect to the RDR)
 - $n_b = 1312$ and a 2ms RF pulse (so-called “Low Power”)
5. Approx. 3.2 km circumference damping rings at 5 GeV
 - 6 mm bunch length
6. Single-stage bunch compressor
 - compression factor of 20
7. Integration of the e^+ and e^- sources into a common “central region beam tunnel”, together with the BDS.



Reduced Beam Power



	RDR 2007	TDP TILC08	SB2009	?
# of bunches	2684-5412	2610-5265	1305-2632	1300
Bunch population	$2 \cdot 10^{10}$	$2 \cdot 10^{10}$	$2 \cdot 10^{10}$	$2 \cdot 10^{10}$
Bunch distance (ns)	6.2-3.1	6.2-3.1	6.2-3.1	3.1
C (m)	6695	6476	3238	1600
h	14516	14042	7021	3500
Kicker freq MHz (1ms linac pulse)	2.8-5.5	2.7-5.4	1.4-2.7	1.4

- DR could be significantly shorter
- Luminosity upgrades get very difficult
- Rely on travelling focus for lumi



BDS WA

- Maintain support for the 1 TeV geometry (missing magnet or some other suitable scheme)
- Assuming 10-15% (TBD – including e+ target dogleg) synchrotron radiation emittance growth at 1 TeV CM.
- Support for travelling focus IP parameter set ($L \sim 2 \times 10^{34}$ with $n_b = 1312$)

Questions :

1. What is the status of a compact lattice design with the above WA
2. Location of non-beamline components (klystrons, P/S etc)



Status of compact lattice design

- **RDR lattice : three changes**
 - Separate functionality of upstream polarimeter, MPS and laser wire photon detection
 - Design of dogleg : with transverse off-set (~2.5-1.5m)
 - Shortening of BDS : allowing more emittance growth
- **Support for travelling focus**

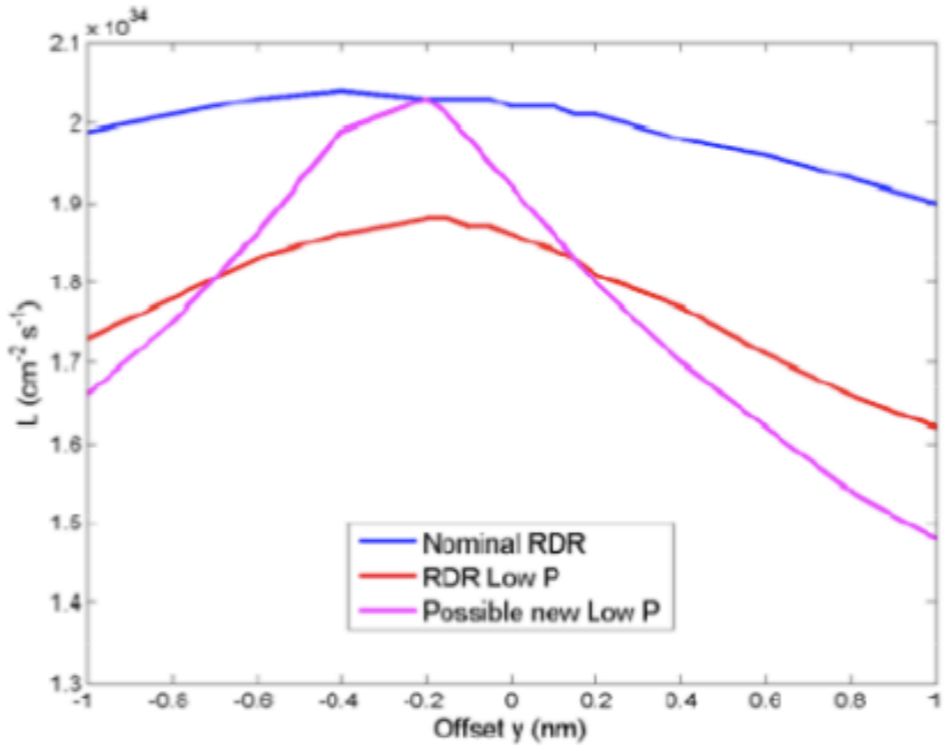


Support for travelling focus

- Travelling focus can be created in two different ways: PAC09 Paper
WE6PFP082
 - small uncompensated chromaticity and coherent E-z energy shift dE/dz along the bunch.
 - $\delta E \approx k L_{eff}^* \sigma_z$; k =relative uncompensated chromaticity. δE needs to be 2-3 times the incoherent spread in the bunch.
Possible set : $\delta E=0.3\%$, $k=1.5\%$, $L_{eff}^*=6m$
 - Use a transverse deflecting cavity giving a z-x correlation in one of the FF sextupoles and thus provide z-correlated focusing.
 - The cavity will be located about 100m upstream of the final doublet, at the $\pi/2$ betatron phase from the FD.
 - The strength required will be ~20% of the nominal crab cavity.
- Tracking studies and possibly mitigation of higher order aberrations are needed for both the schemes.
- Evaluation by detector concepts?



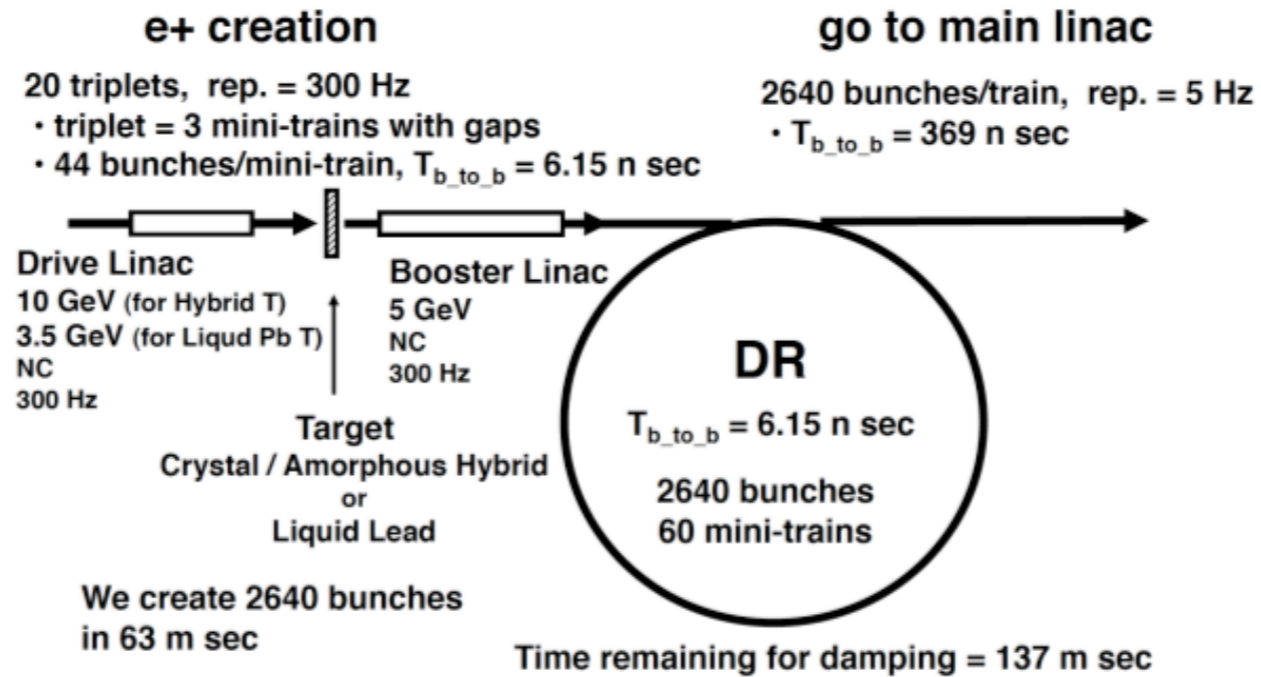
New Low P parameter option



Luminosity vs beam offset

High sensitivity to any beam offset => operation of the intra-train feedback and intra-train luminosity optimization will be more challenging.

300 Hz e+ Source for ILC



T. Omori (KEK)

Accelerator Design and Integration Meeting
29-April-2008, DESY

Many thanks to Chehab-san, Logachev-san, Bonder-san, Wanming-san, Wei-san, James-san, Ian-san, Susanna-san, Louis-san, Liu-san, Potylitsyn-san, Urakawa-san, Abhay-san, Kuriki-san, Takahashi-san, Suwada-san, Kamitani-san

Options discussed without undulators

Polarised positrons not straight-forward

Not in the suggestions of the PMs for the new baseline

Low-P Parameter Sets

- Potential loss of luminosity
- Potential increase of detector backgrounds
- Depends on novel focussing schemes („travelling focus“)
- Potentially quasi-irreversible actions: e.g. reducing damping rings circumference

Positron Sources

- Alternative designs are not easily convertible to polarised positron production
- NB: Polarised positrons are just an option in the baseline parameter document (Heuer report)
- Current working assumption for SB-2009 is still the undulator source

We will follow the discussions in the future
ALCPG meeting is a milestone