Damping Ring Complex CD-1 Status

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System definition: Entrance of LTR to entrance of pre-linac

System design paradigm: While the damping ring is not the single most expensive subsystem of NLC, it was the weakest part of the SLC and includes many very challenging subsystems.

Priority: Criticality (RF, MPS, diagnostics and special systems ↔ system interfaces) and Technical Risk (RF, vacuum, kickers and radiation dose control).

1) Mechanical
   Standard Magnets (2000ea) estimated, schedule drawn up including installation.
   Vacuum chamber fabrication estimate
   Girder drawings
   Alignment review in 2 weeks

2) Electrical
   Power supply table (6MW) drawn up, including floor space/heating loads.
   Cable plant in 2 weeks
   Utility requirements estimated

3) RF
   Cavity taper design begun
   Power source and low level estimate developed

4) Kicker
   RD project; effort required in FY99

5) Instrumentation
   Summary table begun; in review
   Aluminum gun barrel collimation for LTR’s
6) Special systems
   Ring circumference control
   Extraction interbunch phase control using offset RF frequency
   Abort using IGBT kicker pulser
   Dumps laid out; not yet estimated

7) Controls
Injector System Activities

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Major Focus of Activities:

Reverse Engineering of the ZDR
Reduction of Technical Risk

Pulling Together of the Inventory:
  Defining functional requirements
  Defining functional specifications

Dissemination of Information to the Engineering/Physics Groups

Development of Costs
  Including statement of what we are proposing to buy

Filling in the Cracks:
  Precollimation Section
  Instrumentation
  Low level rfControls
Concerns:

- Very little on cost validation, contingency, minimization
- Nothing on cost opportunities through technical risk (internal loads, x2 rf power, reduced redundancy)
- Not much of performance: Looks reasonable for single bunches, personally concerned about train integrity, taking it on faith that the beam dynamics are properly covered downstream of the DRs
- Cascade of Tolerances: need an emittance, jitter, stability budget
- Not much on reliability: by-in-large reliance on redundancy
- Not much on operational robustness: MPS, rate limiting recovery, automation of beam operation, machine diagnoses, phasing, sledding, beam parameter drift
- Not much on installation: Assumption of topdown costs in range of 15%-20%
- Nothing on PPS, MPS(?)
- Nothing on ES&H
**Question:** What specifically in the CD1 Deliverable from the injector Systems?

1. Modified ZDR technical description of the machine
2. Cost of a low technical risk machine
3. Statement of CDR Goals
4. Statement of the CDR Deliverable, including
   - Schedule, Milestones, and Staff Plan for (4),
   - Budget Requirements for (5)
5. All of the foregoing reviewed, validated, and accepted

For CDR, reasonably expect complete and correct functional requirements and specifications for the Injector Complex. Need to demonstrate the polarized electron bunch train; certain damping ring technologies and beam diagnostics. Pessimistic about having tested required rf hardware prototypes.
**Technical Risks** (primarily based on the sins of the SLC):

- Polarized e- Bunch Train
- e+ Source
- DR kickers
- DR rf systems
- DR vacuum chamber

**Emittance** control downstream of the DRs

**Biggest Overall Concern:**

Lack of existence proof of the hardware puts cost and schedule in jeopardy, particularly the 6.5 years to turn-on.

**Biggest Impediments:**

Lack of resources due to dissipation in other erstwhile worthwhile endeavors

And

Idea that the x-band development effort will take care of everything. Recall the 27% contingency for SPEAR III; rather conventional stuff compared to even the Injector System.
2. Philosophy for October is to take a complete “horizontal” view of the Baseline at the expense of depth of detail.

   Technical choices should be taken as needed to fill in a Baseline. We will not attempt to “roll up” a total project cost for this review.

3. Depth of detail to be set by
   1. cost
   2. Criticality - e.g. interfaces between systems
   3. Technical Risk

Charge to the November CD-1 Progress Review Committee

The Gilman Panel has recommended that DOE authorize SLAC to produce a Conceptual Design Report (CDR) for a TeV scale linear collider. Such a collider will be a billion-dollar class facility built by an international collaboration and preparations for it will need to be carefully made. Although the CDR is still in the early stages of development and the design group is still growing in size and capability, we have expanded considerably on earlier studies (contained principally in the NLC Zeroth Order Design Report) and believe that important and useful guidance can be obtained from comments by knowledgeable review at this time. We ask the Committee to address the rather general questions:

Are we headed in the right direction to produce a CDR by Spring of 2001? Are we configured correctly and focused on the right things?

In the context of these questions, the committee should consider the current status of the accelerator design and readiness of the required technologies. Is the Baseline Design credible? Have risks to it, and similarly opportunities for improvements in performance or reductions in cost been properly identified. Is the R&D program focused on these risks and opportunities? Are the management and engineering philosophy and approach appropriate? Are performance, reliability, and cost being addressed in the right balance in the accelerator design and technical development?