



# **S2 Task Force Status (String test definition)**

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# Review of Valencia report

- Task force set up by the Global R&D board
  - **What are the reasons and goals of a system test? Start with TRC R2 list.**
  - **Determine how many RF units are needed as a system test before ILC construction**
  - **Do they need to be in a string?**
  - **Is beam needed?**
- Had reached preliminary conclusions by Valencia meeting
- Expected final report in ~~early~~<sup>mid</sup> January 2007
- Wiki page available off the linearcollider.org website via the Global R&D board wiki or at:  
[http://www.linearcollider.org/wiki/doku.php?id=rdb:rdb\\_external:rdb\\_s2\\_home](http://www.linearcollider.org/wiki/doku.php?id=rdb:rdb_external:rdb_s2_home)



## Preliminary conclusions at Valencia

- The minimum size system test needed to confirm the performance of a new design is a single RF unit with ILC like beam. As many tests are statistical in nature, a longer string test with several RF units or multiple tests with one RF unit would be better.
- As construction of the project starts, a larger second phase system test will be needed to check the final manufactured components. One of the possible scenarios is to build a test linac with contributions of a total of several RF units from the three regional teams of the final consolidated ILC linac system design. It is S2's intention to make recommendations on the suitable scale of this effort by the time of its final report. **Not**



# Progress

- Full first draft of report was completed Jan 18, 2007.
- Went to R&D board and got approval on Jan 26. Sent to the EC on Jan 26.
- We chose to be non-exact in specifying the size of phase 2:
- As construction of the project starts, a test facility (or facilities) will be needed to qualify manufactured RF unit components of the final consolidated ILC linac system design. These components may be built at industries in different regions. One of the possible scenarios is to build a test string with contributions of a total of several RF units from the three regional teams. **There are many factors that will influence the choice of the size of the string and whether the goals can be accomplished instead through several smaller tests or one long string. These factors will be coupled to the future industrialization strategy adopted for ILC main linac components. Therefore we cannot at this stage determine the ideal scale of this second phase of system tests.**



## Another way to estimate phase 2 size

- Assume that the probability of a failure occurring in a cryomodule is distributed as  $1/\text{time}$ , so the probabilities of a failure occurring between 1 day and 20 days, between 20 days and a year, and between a year and 20 years are roughly equal. This corresponds to the leading edge of the bathtub curve (infant mortality) and ignores the trailing edge caused by items wearing out and the flat bottom of the curve due to steady-state failures.
- Before construction begins, assume we want to show that less than 10% of the cryomodules that survive the first day will fail in 20 years. Thus we would tolerate roughly 3% failures in each of the three times periods noted above.
- To show that the failure rate will not exceed 3% in each of these periods, we would need to test roughly 30 cryomodules for 20 days or 15 cryomodules for a year. The latter is more reasonable, that is, under these assumptions the phase 2 test would be the operation of **5 RF units for a year**.
- While this model is very crude and has questionable assumptions, it probably does set the right scale for the size of a phase 2 system test.



# Incredibly rough Phase 1 cost estimate per system test

Phase	$n_{CM}$	$n_{RF}$	CM cost (M\$)	RF cost (M\$)	Basic Infrastruc. cost (M\$)	Cost Sum (M\$)
1	1	1	2	3	12	17
1.1	2	0	4	0	0	4
1.2	3	0	6	0	0	6
1.3	3	1	6	3	0	9
Subtotal	9	2	18	6	12	36
Non-beam related facilities						15
Beam related facilities						35
Total	9	2	18	6	12	86





## Next steps

- We are virtually done
- Studies of industrialization aspects will need to be started in earnest. Test facilities associated with industrialization will also need to be defined. The RDB has already discussed extending the S2 task force to examine these issues.
- No good deed goes unpunished.