University Participation in NLC R&D

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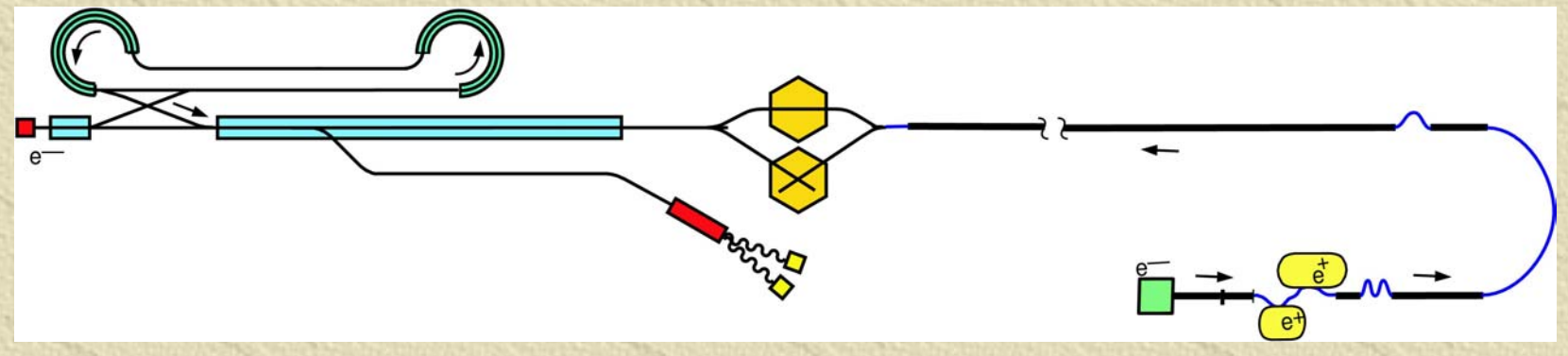

NLC MAC review

May 9, 2002

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Purpose of Encouraging University R&D (Why)

- They asked for it (organized workshops)
- Gets more people involved and hence interested in and advocating the linear collider
- Get started building up the manpower that will be needed to actually build it.

Present University R&D (Who)

- Oxford – prototype intra-train beam-beam deflection feedback
- University of British Columbia – Inertial anchor
- Stanford – Design for Manufacture
- UC Davis – High gradient studies
- U of Maryland – RF

FNAL meeting on April 5, 2001 (How)

- Organized by Gollin and Amidei
- Aimed at FNAL users
- Covered accelerator and detector R&D
- Over 100 participants
- About 15 expressed interest in participating in accelerator R&D
- As of April 19 no one had contacted the organizers to arrange participation
- Organizers are contacting the participants

Cornell meeting on April 19

- Organized by Richie Patterson
- Aimed at making a consortium proposal to NSF in September 2002.
- Covered accelerator and detector R&D
- About 50 participants – many of whom expressed interest
- Working groups were set up to keep up communications

Upcoming meeting at SLAC

- Planned for May 31.
- Aimed at SLAC users and others
- Will cover accelerator and detector R&D
- Has a panel to discuss coordination between SLAC, FNAL, NSF and DOE.

The LIST (What)

- A list of accelerator R&D projects was generated in response to requests from the university community.
- Contains a wide variety of priorities, project sizes, and needed skills.
- NLC and TESLA and generic accelerator R&D are on the list
- About 80 items on list
- Made by brainstorming session at SLAC followed by FNAL input from Dave Finley and Cornell input from Joe Rogers.
- On Web:

http://www-project.slac.stanford.edu/lc/Project_List/intro.htm

List of Extra R&D needs

- I'm walking on a tight rope
  - Want to convince you there are interesting, challenging R&D projects
  - Without convincing you the LC cannot be built.
- Very high priorities are being done: gradient, power source, FF design: not on project list.
- On list are items that if they can be done will decrease cost or improve reliability.
- Many items on list are challenging but pretty clearly doable. Doing them makes the CDR that much more definite and convincing, refines the cost estimates and gets work going that needs to be done.

Sample DB entry

ID: 16 **Priority:** Medium **project_size:** Large **skill_type:** physicist

short project description: superconducting quadrupole vibration test

Detailed project description: There are two options for the final doublet magnets: permanent and superconducting. The main concern about the superconducting method is that coils will vibrate too much since a strong support to the cryostat would cause a big heat leak, and boiling helium may jiggle the coils. Either by calculation, or finding an appropriate magnet, convince people that the quadrupole fields center will move by less than a nm relative to the outside of the cryostat.

Needed by who: NLC and TESLA **present status:** good idea needed **Needed by date:** 6/1/2005

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Note that the contact person is someone who knows more about the project. He's not the person who will arrange who works on what.

Background Calculation and Reduction in the IR.

- Priority: Medium
- Size: Medium
- Skill: Simulations
- Needed for NLC and TESLA
- There are many types of backgrounds: Halo muons, low energy e+e- pairs, synchrotron radiation.
- Use existing simulation tools (and perhaps write new ones) to calculate the background levels and to design shielding and masks to minimize it.\
- A fair amount of work has been done, but more is needed.

Low level RF 500 MHz digitizer

- Priority: Medium-High
- Size: Large
- Skill: Electronics
- Needed for NLC
- There are many channels of this, so it must be CHEAP.: $100 per channel instead of the present $10,000. One idea is to develop an analog waveform recording chip and then do the digitizing more slowly after the pulse has gone by.
- The present RF system down-mixes the RF signals from the structures and diagnostics to an IF in the ~100-500MHz range. This must be digitized at ~500MHz, for the length of the RF pulse (up to 3.2 microseconds), at 12 bits (possibly 8 is ok?).

DR beam size monitor

- Priority: Medium-Low
- Size: Medium
- Skill: Physicist
- Needed for NLC and TESLA
- The beam height in the damping ring will be about 4 microns. We need to non-disruptively measure this on an individual turn in the ring. Traditionally this is done with a synchrotron light monitor. The spot here is so small that one must go to very short (x-ray) wavelengths to get the necessary resolution. We would like a conceptual design of some way to do this. It would then be evaluated whether a prototype is needed

Design and prototype RF BPM both mechanical and electronic

- Priority: Medium
- Size: Large
- Skill: Electronics and Mechanical
- Needed for NLC and likely TESLA
- Reads out a small RF x band cavity. Gives a position that must have a precision of 1 micron and a drift of less than 1 micron per day.
- We think that by using the quadrature signal from the BPM that the tilt from the front to the back of the beam (x-z and y-z correlations) can be measured. This would be an enormous bonus, letting us directly measure the wakefield tail as it forms.

Flow switch

- Priority: Medium
- Size: Small
- Skill: Electronics and Mechanical
- Needed for NLC and TESLA
- High reliability, cheap, rad-hard flow switch. Should not trip when a bubble goes by, should not be the smallest aperture in the system so that it gets plugged up. Should both have a trip point and a flow readout so marginal flow can be detected before it causes a trip.

Fast communications to check pulsed devices (part of HAL)

- Priority: Medium-Low
- Size: Small
- Skill: Electronics and Mechanical
- Needed for NLC and TESLA
- Part of HAL that must check that all pulsed devices (modulators and kickers) are ready to fire just before the particles are extracted from the damping rings. If too many things aren't ready (a few bad modulators may be OK) then DR extraction is aborted. This must be very fast (speed of light should account for most of the delay), so simple logic and wires or fibers must be used. Design such a system to be highly reliable and have necessary diagnostics and readout of what caused the fault. Only a conceptual design is needed at this point.

Overall organization and funding

- Planning consortium proposal to NSF
- Plans for DOE funding are still under development
- Still developing overall coordination between efforts. We are definitely in communication.
- In fact …

Meeting right afterwards

- During your executive session
- Agenda:
  - Decide on speaker to give 45 minute talk at Santa Cruz meeting and what should be said in that talk? Title is: "Lab/University Accelerator R&D Partnerships" We can presumably modify this if desired.
  - How to communicate and organize work
  - How will proposals be reviewed and funded?
  - Compare notes on who is interested in what R&D
  - Revisions to general form of the list
  - Revisions to specific items on the list
- **Any immediate input for us?**