The 8-Pack Project

- Demonstrate full NLC RF power & energy
- Operate eight 75 MW klystrons on one modulator
- Test DLDS components at full power
- Deliver spec. NLC RF power to NLCTA structures

David Schultz
MAC Review, October 25, 2001
The 8-Pack Project

Demonstrate full NLC RF power & energy,

1st with SLED,

Test DLDS components at full power prior to DLDS assembly

Then with DLDS

Deliver full NLC RF power to NLCTA accelerating structures

• Phase 1: 4-Pack
  - Assemble system with:
    • 2 XP3 klystrons to power the SLED, additional XP3 klystron(s) as available
    • a solid state modulator (from the ‘4-dog’)
    • SLED system
  - Produce NLC spec. power: 600 MW 400 ns
  - Test station for running DLDS components at full power

• Phase 2: 8-pack
  - Assemble 8 (total) XP3 klystrons with a (new) solid state modulator
  - Attach DLDS system with two half arms reaching to structures
The 8-pack project layout

- In End Station B
- Adjacent to NLCTA

- Located to deliver RF power NLCTA structures
- SLED line, DLDS, mounted to the NLCTA bunker wall
8-pack modulator and klystron stand

- Stand to be designed and fabricated by LLNL
- Design concerns; earthquake support, secondary containment (oil), maintenance
8-pack location - ESB

8-Pack Project
Phase 1 – 4-pack

• Assemble infrastructure sized for the full 8-pack system
  - Electrical power, Racks, Water
  - Controls system, integrated to the NLCTA system
  - LLRF sufficient to perform the SLED2 test
• Transfer the 4-Pack solid state modulator
  - Fabricate stand sized for the full 8-pack
  - Install HVPS
  - Controls
• Mount 2+ 75 MW XP3’s
  - 2 klystrons are needed to power SLED
  - other(s) will be mounted to gain operational experience
• Fabricate and install SLED system
• Test DLDS components at full power and pulse length
• Not to interfere with the High Gradient Structure Tests
Goals – Phase 1

• Demonstrate SLED II pulse compression on 2 tubes to attain >600 MW, 400 ns (@ cross potent) – meeting the NLC spec.
• Set up a station for high power tests of DLDS components & begin testing components
• Establish a station for 75 MW klystron operation
Reflective TE_{01}/TE_{02} Mode Converter

S. Tantawi & C. Nantista

\[ S = \begin{pmatrix} (P \ 1 \ M \ 1) & 0.0102 & 0.9999 \\ (P \ 1 \ M \ 2) & 0.9999 & 0.0102 \end{pmatrix} \]

Next Linear Collider

8-Pack Project

~0.030” gap
vacuum feed-through plunger
4-Dog Test

8-Pack Project
Next Linear Collider
8-Pack Project

Phase 1 m-SLED II layout
Phase 1 test arm

- Test facility for high power RF components
- Need to prioritize and schedule testing program
Phase 2 – 8-pack

• Install the new 8-pack solid state modulator
  - Using the same HVPS as for 4-Pack modulator
  - New controls

• Outfit with eight (total) 75 MW klystrons

• Assemble DLDS system, 2/8 feeds going to structures
  - (see schematic)

• Take power to NLCTA structures
  - Power two sets of six 0.9m high gradient accelerating structures.
  - Logistics of one DLDS arm bending back on itself is an issue
Goals - Phase 2

- Demonstrate DLDS pulse compression to attain NLC power specs.
  - 500 MW, 396 ns (@ girder)
  - Power NLCTA girders
- Test to high gradient structures to full energy (~200J)
- Investigate operational, stability issues associated with DLDS
• Phase 2 implementation will not have all feature shown here (eg. RF valves)
# 8-pack project budget

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<th>Phase 1: 4-pack and SLED II</th>
<th>Phase 2: 8-pack and DLDS</th>
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* Modulator development & fabrication is not a part of the 8-pack project funding
8-pack project schedule – summary

- Conventional facilities installed – 4/30/02
- Modulator stand installed – 4/15/02
- 4-pack modulator installed – 5/14/02
- Klystrons tested & ready – 12/14/01, 3/29/02, 5/31/02,
- TWT’s installed – 5/5/02
- LLRF checkout – 5/31/02
- SLED II parts finished – 6/28/02
- PEP II down begins – 7/1/02
8-Pack Project Status

• Project scope defined, matches funding profile
  - Subsystem specifications nearing completion
  - Budget being polished, and schedule under development

• Conceptual reviews held for:
  - LLRF system (10/11)
  - High power RF component design (10/9)

• First round of design reviews held
  focusing on details of long-lead items:
  - RF distribution (10/16)
  - Vacuum instrumentation (10/16)
  - Conventional facilities (10/19)