NLC News -

Vol. 2, No. 10, October 2001

Director's Corner

There will be no Director's Corner this month. Look for its return in the November issue.

The NLC 8-Pack Project

David Schultz

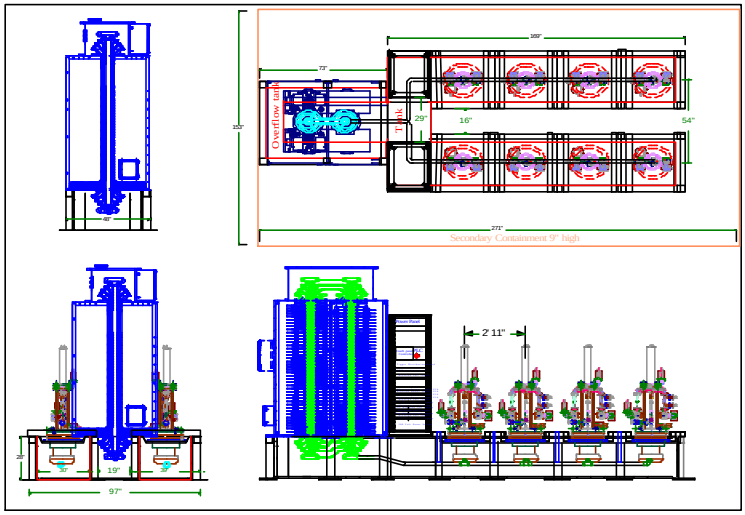
The fundamental building block of rf power in the NLC design is the 8-pack. An 8-pack is a set of eight X-band klystrons powered by a single modulator. The 8-pack provides the rf power used to accelerate beams in the Main Linac. It is connected to eight girders of accelerator structures through a DLDS rf pulse compression system. The DLDS adds the power of the eight klystrons together to achieve the high gradients necessary in the accelerator structures, and then deals this power out sequentially to the eight girders. An 8-pack also needs the low level rf controls to accomplish the rf phase shifting needed for the power addition and distribution. For the 500 GeV collider, the NLC-2001 configuration requires nine 8-packs for each of the 13 powered sectors on each linac, a total of 234 8-packs.

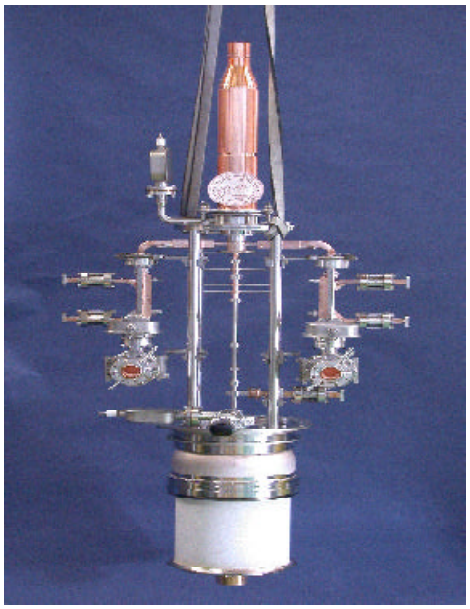
The 8-Pack project is an R&D effort to prove this design. The project will construct an operating unit of the NLC rf power source; a solid state induction modulator powering eight 75 MW X-band klystrons, with a DLDS pulse compression system capable of delivering the 500 MW, 400-ns-long, X-band rf pulse required by the NLC Main Linac. This power will be used to drive two 5.4 m long girders of NLC high gradient accelerator structures (the power which would go to the other girders will go into rf loads). In this final configuration the 8-pack test system will model two arms of the NLC-2001 configuration rf distribution design. The test system will be used to prove the design of the modulator, the 8-pack scheme, the DLDS components used to launch the high power rf modes and direct the modes to girders, and the timing and LLRF systems needed to make the DLDS work. The system will be operated at full power at up to 120 Hz.

The klystrons to be used are the 75 MW Periodic Permanent Magnet (PPM) XP3's now being developed by the SLAC Klystron department. The first permanent magnet prototype is now being assembled and will be tested before the end of 2001. The remaining klystrons to be mounted on the 8-pack test bed will fabricated following the first tube's successful tests.

The modulator is a solid state induction model being developed by the SLAC/ LLNL/Bechtel-Nevada team (see the 'NLC News' for March 2001). The prototype modulator is currently on the '4-dog' test stand in the power conversion building (building 15) at SLAC. It will be tested there by using it to power four 5045 klystrons (the 'dogs') this year, then it will be moved and mounted on the 8-pack stand. A second, higher voltage, modulator is now being fabricated by the modulator team. After it has been tested, next year, it will replace the first prototype modulator on the 8-pack stand as it has the capacity to power all eight klystrons.

NLC 8-PACK MODULATOR





XP-3 75 MW PPM Klystron

The 8-pack project will be located next to NLCTA in End Station B to take advantage of the infrastructure there. This will allow it to power high gradient accelerator structures on the NLCTA beamline. The project will be assembled on the north side of the ESB hall, on the other side of the NLCTA from the present XL4 klystrons. The SLAC/LLNL/Bechtel-Nevada team is developing the modulator and klystron stand for the 8-pack project.

The project will proceed in two phases. In phase one, four klystrons will be mounted on the test stand. Two of these will be attached to a SLED-II pulse compression system (the other two will run into local loads) to generate a 600-MW, 400-ns-long rf pulse. This phase achieves two goals. The first is a demonstration of sufficient rf energy to power the NLC. Although it would be more costly and less energy efficient, the NLC could be made with a SLED-II pulse compression system (as was proposed in the ZDR) instead of using a DLDS. The second goal is the establishment of a test station for high power rf DLDS components. The rf modules that are to be assembled into the DLDS system will be installed here first and subjected to the rf power levels they will need to withstand when put into use.

In phase two of the project, the final four klystrons will be mounted on the test stand. The SLED system will be set aside and the DLDS will be attached to the klystrons. Two of the four double-moded arms of the DLDS will be fed into the NCLTA bunker with one mode from each powering a girder of accelerator structures. These high gradient accelerator structures will be based on the design developed collaboratively by SLAC, KEK and Fermilab. With the accelerating structures attached to the DLDS and powered by the 8-pack, the structures will see the full power and energy they will operate at in the NLC-2001 design.

The 8-pack project has just begun. The goal is to have the modulator, klystrons and SLED-II system of the first phase in place by June of next year so that high power component testing can begin by the end of 2002.

Solid-state Modulator 3-turn HV Transformer Installation

1) Lower cone installation with Craig Brooksby of Bechtel-Nevada, engineer for detailed design and manufacture of mechanical assemblies.

2) Top Cone with HV connector bridges installed. Cones, tubes and bridgesinstalled. Cones, tubes and bridges contain channels for klystron heater, magnet and monitoring cables.

LC02: The Ninth International Workshop on Linear Colliders

SLAC is now preparing for the next Linear Collider workshop, chaired by Dave Burke, to be held on the SLAC campus February 4 - 8, 2002. Posters will soon be in the mail and our web site launched. Watch for it at http://www-project.slac.stanford.edu/lc02/. It will contain information on Working Groups and conveners as well as registration and hotel information. As the program develops, the web site will be updated.

Recent Linear Collider Publications
If you would like to have an NLC-related paper listed, please send information to amlarsen@slac.stanford.edu

I. Linear Collider Collaboration Notes
http://www-project.slac.stanford.edu/lc/ilc/TechNotes/LCCNotes/lcc_notes_index.htm

LCC-0038 "Transverse Field Profile of the NLC Damping Rings Electromagnet Wiggler," J. Corlett, S. Marks, M.E. Ross, 04/00.

LCC-0072, "RF Cavity R&D at LBNL for the NLC Damping Rings, FY2000/2001," R.A. Rimmer, D. Atkinson, J.N. Corlett, G. Koehler, D. Li, N. Hartman, J. Rasson, T. Saleh, R. Weidenbach. October 2001.

LCC-0073, "Microwave Quadrupoles for beam break-up Suppression in the NLC Main Linac," K.L.F. Bane and G. Stupakov, September 2001.

Calendar of Upcoming Events
Conferences of Interest

NLC Machine Advisory Committee, Oct. 24 - 26, 2001 at SLAC.

2001 Nuclear Science Symposium, San Diego, CA, Nov. 4 – 6, 2001, http://www.nss-mic.org/.

NLC/JLC International Study Groups, KEK, Nov. 12 - 16, Tsukuba, Japan.

ICALEPCS 2001, San Jose, CA, Nov. 27 – 30, 2001, http://icalepcs2001.slac.stanford.edu.

Physics and Detectors for the Linear Collider, University of Chicago Gleacher Center, Chicago, IL, Jan. 7-9, 2002, http://LCworkshop.uchicago.edu

LC02, 9th International Workshop on Linear Accelerators, CA , February 4 - 8, 2002, at SLAC. For information http://www-project.slac.stanford.edu/lc02/ or LC02@slac.stanford.edu.

8th European Particle Accelerator Conference, June 3-7, 2002, Paris, France.