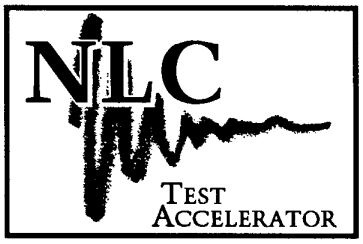

NLCTA-Note #37

November 18, 1994

Subject: NLCTA Kicker Requirements

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To measure the variation of the bunch energies along the 150 ns bunch train in the NLCTA, we plan to use a combination of a vertical kicker, horizontal bend magnet and profile monitor. The bunch train will pass through the kicker during its ramp-up which will produce a vertical spread in the bunch positions downstream of the kicker. A bend magnet will then 'disperse' the bunches horizontally as a function of the bunch energies. Finally, the bunch train will pass through a profile monitor and the two dimensional image will be recorded to provide a measure of the variation of the bunch energy along the train.

A kicker that appears to meet our needs is the Damping Ring style 'solid epoxy magnet'. The requirements for the NLCTA application are discussed below.

Mechanics:

The kicker magnet needs to be supported on an NLCTA girder in an orientation that produces a vertical kick to the beam. Tooling balls should be installed to fiducialize the beam pipe axis to ± 10 mils at each end of the magnet. The ceramic beam pipe inner diameter should be at least 15 mm.

Rise Time:

To view the entire bunch train, the 10% to 90% ramp time should equal the 150 ns duration of the bunch train (longer periods would also work but would produce a smaller kick variation along the bunch train). To view smaller sections of the bunch train in finer detail, a shorter rise time is needed. From the Damping Ring kicker experience, it appears that a rise time as short as 30 ns can be attained. Having the ability to vary the rise time in the 30 to 150 ns range on a reasonably short time scale (minutes) is desirable, but we are willing to compromise if the cost and/or difficulty is too great. We note also that the field ramp-up does not have to be very linear: deviations of up to 20% from linearity are acceptable.

Bend Strength:

The nominal kicker running strength in the Damping Ring kickers (.33 kG-m) translates to a 7.6 mrad angular kick at our maximum beam energy of 1.3 GeV. This will produce a 20 mm vertical spread of the bunches at the profile monitor. Our initial running will be at half of this energy or lower, so we need to be able to lower the field strength to keep the same size vertical image on the profile monitor screen. In principle, this could be done by either changing the kicker pulse amplitude or by increasing the rise time so that the bunch train sees a smaller portion of the ramp period.