

*Minutes of PS Technical Meeting No. 16  
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*The CLIC Test Facility (CTF) at PS  
J.H.B. Madsen*

**Present :** B.W. Allardyce, Y. Baconnier, J. Boillot, D. Dekkers, J.P. Delahaye, R. Garoby, J. Gruber, H. Haseroth, H. Koziol, J.H.B. Madsen, S. Maury, F. Perriollat, J.P. Potier, A.J. Riche, , J.P. Riunaud. D.J. Simon, G. Suberlucq

1. J.H.B. Madsen presented the typical layouts of linear colliders as they are envisaged at SLAC, at KEK, at DESY, in URSS and at CERN. All labs are constructing prototypes and test facilities. Madsen pointed out that the CERN version, CLIC, is different in conception to the others in that it is a two-beam device whereas the rest rely on delivering high power from klystrons directly to the main linac cavities: in a two-beam device there is a drive linac with high beam intensity in which the beam passes through special "transfer" 30 GHz cavities whose object is to take power from the beam and transfer it to another, adjacent linac where the main beam is accelerated; superconducting 350 MHz cavities in the drive linac are designed to replace the power thus transferred.
2. The object of CTF is to provide the means of investigating the generation of the drive beam of high brightness, to test the 30 GHz "transfer" and main linac cavities, how to monitor beams with micron accuracy, etc. To this end the test facility was constructed adjacent to LIL so as to take advantage of the spare klystron in the gallery above LIL; CTF also uses a spare LIL accelerating structure. The layout is similar to that used at BNL for work on high-brightness sources for FEL, so the work has applications other than linear colliders. The facility has been mainly constructed by LP group personnel, but PO, CO, BD and RF groups are also involved.  
Complementary to the CTF is the photocathode lab. Different cathodes are under investigation.
3. CTF is operational and interesting results are already emerging. A new beam diagnostic device has been developed using Cerenkov and transition radiation from a tilted foil viewed by a Streak camera, and this device has already found an application at LIL; it allows very short bunch lengths to be measured (~ ps).

4. Interesting results are also available from studies on photocathodes bombarded with short laser pulses. The desire is to obtain a short electron burst of ps from such a device, which can then be accelerated as the drive beam of the linac. Various geometries have been tried and various combinations of laser and photocathode material are under study. So far no ideal material has been identified, the problems being the lifetime of the surface due to contamination in the residual gas of the vacuum. It appears, from beam simulation studies, that sufficient intensity of electrons ( $10^{12}$  charges per bunch of 3 ps) cannot be produced with a single short laser pulse, so present work is investigating using multiple pulses one after another. An interesting point was made by Madsen that the present laser source gives already enough intensity that it could be used by LIL for LEP, if its lifetime could be increased.
5. In another important development, the phase locking between the laser and the RF is being investigated. The synchro laser is expected for Spring '92. At present a long laser pulse at 213 nm is in use.
6. Finally, the desired CLIC accelerating structure is being tested in a 28 cm long cell through which beam passes with no problems.
7. For 1992 the plans are to add a second CLIC accelerating structure and to measure the real energy gain obtained, and the efficiency of transferring power via the "transfer" cavities, which is an important measurement to make since the whole CLIC design depends on this transfer from the drive linac to the main linac. In addition, to make CTF more versatile, a second gun arrangement is to be installed which will allow photocathode studies to be pursued more independently of the structure studies. Further into the future the idea is to install more RF power by adding a klystron and using a LIPS, which will mean also extending the present building. Testing of 350 MHz cavities has been proposed for 1993/94.
8. Madsen showed that in SL and AT there are roughly 15 full-time equivalent people working on CLIC and in PS a similar number (mainly in LP Group). So far the CTF budget comes entirely from the DG allocation to CLIC (although PS paid for the building); the CTF budget for 1991 is 1.5M. Madsen suggests that some money from the PS exploitation budget be allocated to CTF to aid in the every day running of the facility.

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### *Distribution*

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