

Design of a RF Gun for Heavy Beam Loading,
R. BOSSART, M. DEHLER, CERN - For the generation of the drive beam for the CLIC Test Facility, a rf photoelectron gun is required to generate a charge of $1 \mu\text{C}$ in a train of 48 bunches. The extracted beam energy of 6.5 J leads to a pronounced decrease of the field gradient, causing strong variations in the transverse and longitudinal beam dynamics. The drop in beam momentum yields a variation in focusing of the following solenoid leading to a blow-up of the transversal emittance. A second effect is the change of the bunch spacing caused by differing bunch velocities. These effects are to a large extent determined by the beam loading in the first cell, which contains the photocathode. In order to reduce this effect with moderate expense of RF power, a new gun design has been developed using a TM_{02} resonance in the first cell followed by two standard TM_{01} cells. Beam simulations show that with this gun, the overall change in the longitudinal bunch spacing can be strongly reduced. Also the chromatic effects in the solenoid due to the drop in longitudinal momentum are partially compensated.