

ACCELERATION OF ELECTRONS BY WAKE
FIELDS OF A REGULAR TRAIN OF BUNCHES
IN A DIELECTRIC WAVEGUIDE
OF FINITE LENGTH

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S u m m a r y

The excitation of wake fields by a regular train of relativistic electron bunches in a cylindrical waveguide, which is partially filled with a dielectric, is considered. The expressions for all components of the electromagnetic field excited in a dielectric waveguide are obtained. The waveguide's finiteness along the longitudinal direction is accounted by the introduction of the wake field's trailing edge, which propagates with the velocity equal to the group velocity of the resonance wave. The numerical simulation of the self-consistent dynamics of particles of bunches in the wake fields, which the bunches excite themselves, is carried out. It is shown that, in the cases of relativistic bunches with small charge or ultra-relativistic intense bunches, taking the dynamics into account does not influence essentially the excited field. High radial stability of such bunches is found. Acceleration of electrons in a wake field of a train of bunches is investigated. Numerical calculations are carried out for the systems with parameters which are close to those of the experiments carried out in NSC “KHIPT”, Ukraine and in the National Laboratory of High Energy Physics (NLHEP), Japan. The calculated accelerating fields are 100 kV/m and 18 MV/m, respectively.