Recently a significant progress has been achieved in generation of electromagnetic pulses in centimeter and millimeter waveband based on superradiance (SR) from high-current extended electron bunches formed by explosive emission cathodes [1]. Generated pulses are characterized by record-breaking (gigawatt) peak power and ultra-short (subnanosecond) duration. At particle energies up to 300 keV, current up to 1 kA and the bunch durations up to 1 ns the most effective mechanism of SR pulses generation is the Cherenkov one, when a rectilinearly moving electrons interacts with the backward wave propagating in a periodically corrugated waveguide with period and diameter ~ \( \lambda \). Advance of Cherenkov SR sources into short wave ranges needs fabrication of periodic micro- and nanostructures that can be fabricated based on modern technologies. Nevertheless in these wavebands waveguides with large oversized factor should be used, and process of SR needs special investigation.

This report is devoted to the theoretical analysis of generation of high-power terahertz SR pulses by relativistic electron bunch moving above shallow corrugated surface and exciting an evanescent surface wave. The formation of evanescent slow wave is described within the framework of a quasi-optical approach where the radiation field is presented as a sum of two partial counter-propagating wave-beams. It is shown that for generation of single THz pulse the particles energy should be increased up to 1-3 MeV and the bunch duration should be about several picoseconds. At present bunches formed by photo-injection guns provide the necessary characteristics [2]. The results of theoretical consideration are in a good agreement with direct PIC code simulations.