The plasma beat–wave accelerator (PBWA) scheme is one of a number of methods for producing relativistic electron plasma waves via the interaction of an intense laser pulse with an underdense plasma. The PBWA scheme involves the co-propagation through a plasma of two laser pulses of slightly differing frequencies, \( \omega_1 \) and \( \omega_2 \) such that \( \omega_1 - \omega_2 = \omega_b \ll \omega_1, \omega_2 \). The superposition of these laser envelope with which there is an associated ponderomotive force. If the frequency of the force is resonant with the electron plasma frequency \( \omega_{pe} \), a large–amplitude relativistic electron plasma wave (EPW) can be produced. These plasma waves are of particular interest, since they can be used to accelerate electrons efficiently to high energies with short distances.

In this paper, the direct acceleration of electrons by using crossed linearly polarized Bessel beams with slightly different in the frequency in underdense plasma is studied. The electric field of a longitudinal electron plasma oscillation with plasma velocity \( v_{ph} \) near the speed of light (c) accelerates charged particle to high energies is presented. It is possible for beat wave to resonantly drive large amplitude electron plasma waves.