

## Helical Two-Stream Relativistic Electron Beam Parameters Influence on Space Charge Wave with Broad Frequency Spectrum Forming

We develop the cubic non-linear theory describing the dynamics of multiharmonic space charge wave (SCW), which harmonics frequencies are smaller than the two-stream instability critical frequency, with different relativistic electron beam (REB) parameters. The self-consistent differential equation system for multiharmonic SCW harmonic amplitudes was elaborated in a cubic non-linear approximation. We investigate the influence of different REB parameters such as the input angle with respect to focusing magnetic field, the average relativistic factor value, the difference of partial relativistic factors, the plasma frequency of partial beams on the frequency spectrum width and the multiharmonic SCW saturation levels. We suggest the ways of multiharmonic SCW frequency spectrum width increasing in order to use it in multiharmonic two-stream superheterodyne free-electron lasers which main purpose is to form a powerful multiharmonic electromagnetic wave.

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