



Contribution ID: 39

Type: talk

Homogeneous and Identical Focusing of Train of Relativistic Positron Bunches in Plasma

Tuesday, September 17, 2019 6:00 PM (20 minutes)

Focusing of electron and positron beams in collider is important [1-7]. The focusing mechanism in the plasma, in which all electron bunches are focused identically, has been proposed [5-7]. This lens is researched by simulation by lcode [8] in this paper for short positron bunches. It is shown that there are two lenses. It is necessary that in one case the length of 1st bunch should be equal to half of wavelength $L_{b1} = \lambda/2$, all other bunches are short, $L_b < \lambda/2$, the charge density of all other bunches is in two times larger than of 1st. The intervals between bunches should be $L = p, p = 1, 2, \dots$. Focusing field is the same along the bunch $F_r = const$ in areas of bunches.

In the second case it is necessary that the charges of all bunches are in $(2)^{1/2}$ times larger than of 1st bunch. The interval between 1-st and 2-nd bunches equals to $(n + 1/8), n = 1, 2, \dots$. The interval between the other bunches is multiple to wavelength. It is shown that only 1st bunch is in the finite $Ez \neq 0$. Other bunches are in zero longitudinal wakefield $Ez = 0$. Focusing force F_r is the same along the bunches.

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Session Classification: WG8 - Positrons

Track Classification: WG8 - Advanced and novel accelerators for High Energy Physics