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Design of S-band high efficiency klystron

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To reduce energy consumption and cost has become a prime objective of the development and operation of high energy particle accelerators. RF sources are major energy consumption components of any RF system for the particle colliders. The 30 GeV injector linear accelerator (LINAC) for the CEPC (Circular Electron and Positron Collider) requires S-band klystrons with higher efficiency to reduce energy consumption and cost. In this paper, two novel bunching method, including COM (Core Oscillation Method) and BAC (Bunching Alignment and Collecting), are applied to the BEPCII (Beijing Electron Positron Collider) S-band klystron. These methods increase the efficiency of klystron from 45% to 55%, therefore increasing the output power to 80 MW with the same operation voltage. The preliminary optimization design is completed with 1-D disk model based AJDISK code and further checked by 2-D code EMSYS. The density modulation of electron injection is improved by selecting a suitable cavity string structure and thereby to optimize electron bunching. Further improvement in the RF conversion efficiency of the klystron is also planned and is in line with a requirement to go green.

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