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Progress on high efficiency klystron for CEPC at IHEP

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After the discovery of the Higgs particle at Large Hadron Collider (LHC) in 2012, a 240 GeV circular electron positron collider (CEPC) was proposed in China. The beam power of CEPC is about 60 MW. To reduce the energy demand and operation cost for CEPC, a 800 kW CW klystron with efficiency of more than 80% are being developed as a priority key technology at Institute of High Energy Physics, Chinese Academy of Sciences. So far, several klystron prototypes have been designed, manufactured and high power tested. The first klystron prototype with a second harmonic cavity successfully obtained 804 kW pulse power with output efficiency of 65.3% and 700 kW CW power on March, 2020. To improve the efficiency to more than 75% in the second stage, a lower perveance and CSM bunching method have been applied. Due to the crack of ceramic window and spurious oscillation in RF cavity, the klystron just obtained 630 kW CW power with output efficiency of 70.5% on July, 2022. After problem analysis, this klystron is being repaired and the high power test will be carried out on October, 2023. The third prototype is a Multi-beam klystron with efficiency of more than 80%, which is being manufactured and will be tested in the middle of 2024. In this presentation, the progress on high efficiency klystron for CEPC will be introduced. Also the detailed design and test results will be presented.

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