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Two Stage High Efficiency Klystron for FCC-ee

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The innovative concept of two-stage multi-beam Klystron has been previously proposed and studied for a 1GHz 20MW Klystron for CLIC. This technology utilizes low voltage electron beam in its first stage to reduce the overall tube length, followed by DC post acceleration in the second stage to ensure ultra-high efficiency. This topology is very practical to provide compact design at a low frequency (UHF and L-band), high power (Multi Megawatt), high efficiency (>80%) klystrons. Hence the same concept was adopted for the development of a 0.4 GHz 1.2 MW Klystron for FCCee. In this report, the modelling and design study of the FCCee MBK with two-stage (TS) configuration is presented. Overall, the Klystron is expected to deliver a maximum power of over 1.2 MW with 80% efficiency. Preliminary design of the beam optics and solenoid has been done in 2D CGUN code. The interaction RF circuit was optimized using CERN-mad code KlyC and verified using 3D Particle-in-Cell simulation codes. The collector is designed to handle the full beam power dissipation in DC mode with maximal heat load of 500 W/cm². The current status of TS MBK FCCee klystron development will be presented.

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