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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 investigated and studied in a 1GHz 20MW Klystron for CLIC. This technology utilizes low voltage electron beam in its first stage to compress the tube length and DC post acceleration in the 2nd stage to ensure ultra-high efficiency. It is very practical for the compact design at 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 0.4GHz 1.2MW Klystron for FCCee. The beam-wave interaction optimization of this device has been performed in an updated version of KlyC and innovative RF parts such as a RF rejecter structure for the post-accelerating gap and photonic array-inspired rods for the output cavity will also be demonstrated in this report. Further exploration of the new technology, and practical beam optics design has been preliminarily done in a new 2D code CGUN and further complex 3D optimization is ongoing. Overall, the Klystron is expected to deliver a maximum power of over 1.2MW with 80% efficiency.

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