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FCC RF power sources and powering schemes

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The recent evolution of the FCC operational regime towards Reverse Phase Operation (RPO) for Z-pole has reduced by factor 2 RF power level required to feed individual cavities and put stringent requirements on the temporal RF power modulation of the two sets of accelerating SRF cavities in the collider. In this new environment, High Efficiency TS MBK Klystron, developed for FCC in the past few years, could not provide efficient operation anymore, as it loose almost 20% in efficiency due to operation, on average, well below the saturated RF power level. The new gridded tube approach called Tristron (hybrid of triode and klystron) was suggested to replace MB TS klystrons. Tristron was studied and optimized at CERN as a candidate for FCC RF power source. The final multi-beam (10 beams) Tristron design at 400MHz showed an excellent performance in RF power range from 300kW to 600kW with efficiency exceeding 90%. MB Tristron also supports RPO regime preserving operational RF efficiency at 90% level, thanks to the inherent properties of the electrons bunching mechanism in the gridded tubes. The FCC MB Tristron design and performance will be presented together with the corresponding RF powering schemes of the booster and collider.

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