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High Efficiency RF Source Development

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Research is in progress to develop high efficiency RF sources for driving accelerators and colliders. These include a 350-450 MHz multiple beam triode, a single beam klystron at L-Band, and a multiple beam klystron at C-Band. The goal efficiency for these devices is 80% or better.

A single beam klystron estimated to operate at 80% has been built and is awaiting testing. The klystron uses a COM-type circuit and is designed to produce 200 kW CW at 1.3 GHz. The tube is approximately ten feet long and presented several challenges for assembly and handling.

Research is continuing on a multiple beam triode-based RF source to produce 200 kW CW between 350 – 700 MHz. If successfully developed, this would provide the lowest cost, most compact RF source in this frequency and power range. The efficiency is estimated at 80%, and the cost would be approximately 50 cents per watt, which is less than a fourth the cost of a comparable klystron or solid state system.

A multiple beam klystron at C-Band was designed to produce 200 kW CW at 5.8 GHz using six beams to reduce the operating voltage. The program goal is an interaction efficiency exceeding 80%, which was achieved computationally using a COM circuit. The tube would operate at 45 kV with a microperveance of 0.1. The primary challenge was achieving high beam quality for the six electron beams. A proposal is being reviewed to provide funding to complete the design and build and test the klystron.

Working group

WG7 : Linear Colliders

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