Tentative Designs of X-Band and W-Band Klystrons with Modulated Hollow Beam

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ABSTRACT

The klystron with hollow beam supplies high RF power with great reliability. This paper presents design proposals for klystrons operating in X-band and W-band with application of hollow beam.

The X-band TM_{110}-mode klystron has a centre frequency of 10 GHz and easily achieves 500 kW output power. The power gain of the klystron is nearly 50 dB. In the X-band TM_{310}-mode klystron in the hollow beam has an initial beam power of 5 MW, while the output power reaches 2.2 MW. The power gain is 29 dB. In the investigation hollow beam is present as continuous wave. The proposed W-band klystron design uses an input signal of 30 GHz to realize an output signal of 90 GHz. The output power reaches 1.12 kW with the help of a penultimate cavity. The total efficiency can achieve 10.4% with a depressed collector.

As for the electron gun design, an electron gun design proposal with a hollow beam for X-band TM_{310}-mode klystron is accomplished. This electron gun uses an uncompressed beam. For applications which require beam compression, a possible beam compression strategy is presented.