MURI W-band klystrino beamtest results
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Abstract: Recent beamstick test results of the W-band klystron (klystrino) are presented. The klystrino uses LIGA manufactured cavities and PPM focusing. The design goal is 100 kW peak power and 1 kW average power at 1000 pps. Perveance and transmission test results of the PPM beamstick are presented and compared with DEMEOS simulation results. Small signal gain calculations and numerical modeling in 2 dimensions have been used in the design of the cavities and output circuit. The prototype device is entirely contained within a small vacuum chamber. Block ceramic windows 1-wavelength thick brazed into WR-10 waveguide will be used to transmit microwaves into and out of vacuum.

Fig. 1
The klystrino cathode (glowing red) is processed and temperature calibrated in a bell jar with the anode assembly removed. The cathode diameter is 1.45 cm.

Fig. 2
The beamtester with the anode and PPM stack bolted into place (compare with Fig. 1). The magnets fit into the slots of a brazement assembly of pole pieces and copper spacers.

Fig. 3
The isolated collector is 1/4" copper tube brazed into a ceramic ferrule. Typical dop rates during testing are 5 pps which reduces the average beam power to less than 100 mW. A water cooled collector will be installed for high duty factor beam and RF testing later this year.

Fig. 4
The beamtester assembly is bolted to an 8" diameter conflat flange of the vacuum vessel (Fig. 5) and 3 copper posts (Fig. 3) such that the output of the PPM stack is aligned with the collector. The white ceramic housing isolates the 110 kV gun assembly and the long guide-tube contains the 3 input guides to the focus electrode. The focus electrode can be biased with respect to the cathode in order to adjust beam focusing.

Fig. 5
The beamtester assembly in Fig. 4 is enclosed within the vacuum vessel shown here. The large white ceramic is a recent upgrade from the previous ceramic (picture below) in order to prevent break-down at 110 kV.

Cold test data of block ceramic window brazed into WR-10 waveguide. The blue curve in 1 wavelength thick and therefore more narrow band than the other two curves which are 1 wavelength thick. The red curve was grounded to 0.41" whereas the target thickness of the green curve window was 0.642". The resonant frequency shifts about 2 GHz per mil (0.1"") of window thickness.