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Results of an S-band Sheet Beam Klystron Development Effort

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Sheet beam klystrons have many advantages over traditional round beam klystrons that are desirable for a variety of applications. They can operate at a high efficiency and relatively low voltage by keeping the perveance per unit area of the electron beam low. This is achieved by spreading the beam out in one dimension which decreases the current density and power density. They can produce higher r.f. output power and operate at higher frequencies because of the decreased current density and decreased power density. Unfortunately, due to increasing the dimensions in one direction, the drift tube is often no longer cut-off and supports TE modes. The TE modes can interact with the electron beam in an undesirable way causing the well-known TE mode instability that has plagued previous sheet beam klystrons.

A mitigation technique for the TE mode instability has been discovered and implemented in a 2.856 GHz sheet beam klystron. The tube was designed to operate nominally at 53 kV / 270 A to produce 6 MW peak / 6 kW average power of r.f. We will discuss various features of the design, some challenges overcome during the fabrication process, and test results.

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