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A Test Stand used to Evaluate a Prototype S-band Sheet Beam Klystron

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A prototype S-band sheet beam klystron has been fabricated and tested. To enable testing of this one of a kind tube, a unique test stand was created that we will discuss in this presentation. The sheet beam klystron was designed to operate at 2.856 GHz and nominally produce 6 MW peak / 6 kW average r.f. power. A ScandiNova solid state modulator delivers the high voltage pulse to the potted electron gun which is designed to operate at 53 kV / 270 A. The electron beam is confined by an electromagnet which is wrapped directly on the tube body. For this prototype the electromagnet is composed of six individual windings that are powered by six different power supplies. This enables us to tune the magnetic field for maximum beam transmission. The cooling requirements of the test stand are provided by a ten ton chiller and dual manifold system. The two manifolds are needed to provide high pressure cooling to the modulator and r.f. loads as well as low pressure cooling to the electromagnet / klystron body, r.f. windows, and collector. Extreme care was taken to regulate the pressure on the klystron body. This was aided by various valves in the manifold design and by using two pumps from the chiller. Flow, pressure, and temperature sensors are used to monitor the coolant circuit. A control system was implemented to run the experiment which monitors and/or controls the modulator, filaments, solenoid power supplies, vacuum, electronically controlled valves, and coolant sensors. It can shut down the appropriate systems when a dangerous situation is detected and ensures various parameters are increased or decreased at safe rates. The control system also records various diagnostic signals needed to characterize the klystron performance.

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