Output Cavity Studies for a Low Voltage mm-Wave Sheet Beam Klystron, W. BRUNS, H. HENKE, S. SOLYGA, TU-BERLIN - There are two major advantages in applying sheet beams for mm-wave amplification rather than round beams: The limitation in power is alleviated since the beam current can be increased by increasing its width rather than its density, and the requirements of microfabricational techniques are better met by planar geometries. Unfortunately, these advantages have to be paid for with harder efforts in cavity design since the electric field in the cavities has to be flat over the whole beam width. As already reported in [1] and [2], this flatness can easlily be achieved for unloaded cavities. However, since field flatness comes along with small transverse group velocity, if such a cavity is coupled to from the sides and heavily loaded as it is the case for output cavities, the field flatness may be destroyed. Another major problem arises from low beam voltages at w-band, since the transit time of a 1 mm gap easily becomes a full period. Thus, reasonable shunt impedances can only be achieved with travelling wave structures. This paper reports on the design of a suitable travelling wave structure and the results from simulations of heavily loaded flat field cavities with the electromagnetics code GdfidL [3].

[1] D. Yu and P.B. Wilson, Sheet-Beam Klystron RF Cavities, Proc. of the 1993 Particle Accelerator Conference, Washington DC, May 17-20, pp. 2681-2683

[2] S. Solyga, W. Bruns, Cavity Design for a Planar mm-Wave Sheet Beam Klystron, Proc. of the 5th European Particle Accelerator Conference, Barcelona, Spain, June 1996, pp. 2140-2142

[3] W. Bruns, GdfidL: A Finite Difference Program for Arbitrarily Small Perturbations in Rectangular Geometries, IEEE Trans. on Magn., no. 3, May 1996, pp. 1453-1456