TRANSVERSE TWT WITH TWISTED HOLLOW WAVEGUIDES*

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Transverse TWTs based on the synchronous interaction of a thin electron beam with a circularly polarized slow wave were first proposed in 1960[1]. Such TWTs promised to exhibit high linearity with high efficiency at comparable to a conventional TWT output power[2]. However, attempts to demonstrate a transverse TWT have encountered significant problems due to the presence of parasitic oscillations, and due to the challenges of manufacturing of a slow wave circuits that support circularly polarized waves[3,4,5].

New twisted hollow waveguide structure recently introduced for accelerators[6] are very promising for transverse TWT applications. This structure satisfies requirements for circuit mode of transverse TWTs, since their lowest order mode is circularly polarized. Electromagnetic simulations of twisted hollow waveguides have been performed using the ANALYST[7] code. It was found that these structures are capable of supporting slow waves with phase velocities as low as 0.2c, consistent with application in a ~ 100-500 Watt CW power TWT configuration.

The properties of this structure have been used to simulate the performance of a transverse TWT using the CHRISTINE code[2]. The performance of such TWT has been evaluated for beam voltages in the range of tens of kV.

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