

Curved Ring-Bar Slow-Wave Structure for Wideband MW-Power Traveling Wave Tubes

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Abstract—A coupled transmission line (TL)-based slow-wave structure is presented and characterized. This TL is a modified ring-loop structure referred to as curved ring bar. It inherits the features of the ring-loop structure, but includes elliptic loops to enhance the axial electric field for TM_{01} mode. The structure demonstrates wideband behavior and is especially designed for high-power traveling wave tube amplifiers. It is characterized using a pair of uniform and identical coupled TLs utilized to achieve desired dispersion characteristics. This characterization explains the dispersion curves and interaction impedance. A simple way to derive dispersion behavior in terms of circuit parameters is also provided. A traveling wave tube (TWT) model is also presented that gives an output power of 1 MW across 1.8–2.4 GHz. It is noted that the designed TWT provides a bandwidth of 20% and delivers an output power of 1 MW, larger than previously reported in S-band.

Index Terms—Coupled transmission lines (TLs), slow-wave structures (SWSs), traveling wave tubes (TWTs).