

Half-Ring Helical Structure for Traveling Wave Tube Amplifiers

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Abstract—We introduce a new slow wave structure referred to as half-ring helix for traveling wave tube (TWT) applications. This new structure is shown to achieve 27% size reduction with concurrent nondispersive response across the S-band. A 10-dB gain improvement was also observed as compared with the standard helix TWT. Moreover, the designed traveling wave tube can attain a maximum saturated output power of 1 KW and a bandwidth of 0.75 GHz (2.5–3.25 GHz). This improved gain and power handling, along with a satisfactory bandwidth, makes the structure attractive as compared with conventional ones. In this paper, we present the TWT design with numerically computed cold test results and evaluate its hot test performance using particle-in-cell simulations.

Index Terms—Slow wave structure (SWS), traveling wave tube (TWT), traveling wave tube amplifiers (TWTAs).