

RF Priming for Operation of Relativistic TWT With Reflections Near Cyclotron Resonance

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Abstract—As the value of the guide magnetic field approaches the stationary boundaries of the region of cyclotron suppression of feedback (RCSF) from outside this region in a traveling wave tube (TWT) with reflections from ends of its slow wave structure, generation is increasingly (on average) delayed. Near the boundaries, the delays become significantly longer than the typical duration of the applied voltage. As a result, in experiments, the measured RCSF is wider than their stationary boundaries, which we have identified using theory and computer simulations. It is tempting to use this region for amplification of an external signal. In this paper, we show that outside the stationary boundaries of the RCSF, an injected signal entering into a TWT leads, as a rule, to fast RF generation even for such an injected signal as an unmodulated waveform.

Index Terms—Amplification, Cherenkov synchronism, locked generation, positive feedback, resonant traveling wave tube (TWT), RF priming.