

Design Optimization for a Novel Class of High Power Microwave Sources Using a Farming Model

Parallelization of a Real-Valued Evolutionary Algorithm

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- **The multi-cavity relativistic klystron oscillator (McRKO) is a high power microwave (HPM) source in which the kinetic energy of a relativistic electron beam is converted into coherent microwave radiation. A theoretical model of the device is developed relating the growth rate of the microwave output power to the design parameters.**
- **Optimization of the growth rate via analytical and standard numerical techniques is intractable because of the existence of many local optima. Instead, the growth rate is optimized using a real-valued evolutionary algorithm (EA), which performs mutation, selection, and recombination on a population of candidate design parameters.**
- **Multiple single-processor experiments using modest population sizes identify high-growth rate designs in many different parts of the design space, suggesting that they are still not close to the global optimum. Multiple-processor experiments permit larger population sizes and correspondingly greater coverage of the design space without significantly increasing execution time.**

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