PROGRESS IN THE CONTROL OF A "SMART TUBE" HIGH POWER BACKWARD WAVE OSCILLATOR

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Previous results from our studies of the control of various parameters of an intense beam-driven relativistic backward wave oscillator (BWO) include maintaining a specified or desired output power over a determined frequency bandwidth, and maintaining a constant frequency over a wide range of power [1]. This was accomplished using an iterative learning control (ILC) algorithm that yielded the appropriate input variables for the electron beam, as well as the appropriate displacement of the slow wave structure from the cutoff neck.

A problem of much greater complexity is the simultaneous control of both frequency and power, involving the independent mapping of both power and frequency dependence on the two input variables: cathode voltage and slow wave structure displacement. The resultant two-variable system is implemented and tested for convergence with minimal iterations. The experimental results are presented, along with the theoretical background and hardware description.

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[1] C.T. Abdallah, V.S. Soualian, and E. Schamiloglu, "Toward "Smart Tubes" Using Iterative Learning Control," IEEE Trans. Plasma Sci., vol. 26, pp. 905-911, 1998, and references therein.

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