A PID FEEDBACK CONTROL SYSTEM FOR UTILIZING A RF EMISSION TUBE AT THE MAXIMUM EFFICIENCY

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Degree of Master of Science

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ABSTRACT

Thermal emission tubes are expensive electron devices regularly used in numerous applications such as Radio Frequency (RF) amplifiers, medical instruments, etc. Such a thermal tube designated as TH558E is used as a RF amplifier within a 250kW Short Wave transmitter in the Sri Lanka Broadcasting Corporation in Trincomalee. In this RF amplifier circuit, a control scheme is integrated with the fine tuning of RF amplifier's final stage to maintain the desired power efficiency and the output power. The present control system configured by the transmitter manufacturer shows poor control capabilities for some broadcasting frequencies and, as a consequence power efficiency and life time of the thermal emission tube is significantly reduced. In this work, we propose a control scheme which is based on multiple Proportional Integration Derivation (PID) controllers and H-infinity optimality criterion to overcome the deficiencies of the original control scheme. Here, a new controller is embedded with an optimal automated tuning method. It is tested for fine-tuning of the RF amplifier's final stage. The PID control gains are found using an algorithm based on Linear Matrix Inequality [LMI] ensuring the stability. The simulation and test results prove that the proposed control architecture is capable of providing the desired performance.

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