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## Disturbance Observer Application for the Compensation of the Phase Drift of the LANSCE DTL LINAC Solid State Power Amplifier

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The front end of Los Alamos Neutron Science Center (LANSCE) linear accelerator (linac) uses four 201.25-MHz Drift-Tube Linac (DTL) modules to accelerate the H<sup>+</sup> and H<sup>-</sup> beams to 100 MeV. Three of the 201.25-MHz DTL tanks, Modules 2, 3, and 4, are powered by diacrodes and the first DTL tank, module 1, is powered by a tetrode. A 20-kW solid-state power amplifier (SSPA) is used to provide 15 kW of drive power to the tetrode. The SSPA is water-cooled and consists of 24 push-pull LDMOS transistors operating at 45% of their power saturation capability, providing ample power headroom and excellent linearity. However, the phase of the SSPA is perturbed at +/-20 degrees over a few ten minutes partially caused by the temperature dependent phase variation of the air-cooled SSPA driver circulator. This phase variation consumes most of the phase control margin of the cavity field feedback controller. In order to mitigate the effect of the SSPA's phase variation on the cavity field, a disturbance observer has been designed and implemented on the cavity field control FPGA. In this paper, the disturbance observer design and functions as well as its short- and long-term performance are described.

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