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Progress of High-Efficiency L-Band IOT Design for Accelerator Applications at SLAC

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Recent efforts at SLAC aim at developing high-power accelerators powered by compact, high-efficiency rf sources such as klystrons and Inductive output tubes (IOT). In particular, a high-efficiency IOT is an electron-beam-driven RF source employed in the UHF band that offers high efficiency at variable output power levels. Due to the improved linearity, high efficiency, and reduced size, it is the RF amplifier of choice in the TV broadcast market. Stellant Systems (formerly L3Harris Electron Devices) has long pioneered the IOT design and recently leveraged its power toward various accelerator applications [1]. In this talk, we show the progress of developing a 1.3 GHz HEIOT in terms of design and performance. We also show results of 3D space-charge beam dynamics simulation of an L-Band inductive output tube (IOT) RF electron gun using the accelerator code ACE3P as a transformative approach to HEIOT design. We also show an optimization scheme of the rf output cavities that results in >100 kW of average power with an upward of 80% power efficiency.

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Footnotes

[1] M. Boyle et al., "L3 L6200 Multibeam IOT for the European Spallation Source," IEEE Trans. Electron Devices, vol. 65, no. 6, pp. 2096–2100, Jun. 2018.

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