IPAC'23 - 14th International Particle Accelerator Conference



Contribution ID: 2488 Contribution code: WEPL132

Type: Poster Presentation

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

Wednesday, 10 May 2023 16:30 (2 hours)

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 electronbeam-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.

Funding Agency

This work is supported by U.S. Department of Energy Contract No. DE-AC02-76SF00515, and DOE 2020 HEP Stewardship

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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Session Classification: Wednesday Poster Session

Track Classification: MC7: Accelerator Technology and Sustainability: MC7.T08: RF Power Sources