Contribution ID: **172** Type: **Invited Talk**

Fabrication and Beam Testing of a 180 GHz Colinear Wakefield Accelerator

Thursday, November 13, 2025 9:00 AM (20 minutes)

X-Ray Free Electron Lasers (XFEL) allow for intense, ultrashort X-ray pulses to probe matter at the femtosecond scale with high spatial resolution. Despite the critical research enabled by XFELs, there are currently only a handful of facilities, resulting in a fraction of proposed experiments being conducted.
An issue preventing the broad dissemination of XFELs is their overall size and cost along with the limited number of users they can accommodate compared to storage-ring-based synchrotron sources. A multi-user XFEL based on beam-driven collinear structure wakefield acceleration (SWFA) using corrugated waveguides as accelerating structures offer a path to deploying a compact, multi-user, XFEL. In addition to supporting simultaneous experiments (~10), such an XFEL could also be more versatile and could support the generation of attosecond pulses at high-repetition rates while also providing a path to full coherence.
Argonne National Laboratory has recently developed a conceptual design report for such an XFEL facility – the Argonne Sub-THz Accelerator (ASTAR). This talk will cover the design of ASTAR, testing of its components, and electron beam testing that was conducted at Brookhaven National Lab's Accelerator Test Facility. Additionally, discussion regarding beam break up instabilities and controlling them via gradient quadrupole magnets.

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