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Short-pulse RF research at the AWA facility

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The Argonne Wakefield Accelerator (AWA) facility supports an extensive research portfolio along three themes: electron beam production, electron beam manipulation, and electron beam-driven structure wakefield acceleration (SFWA). This talk presents efforts at AWA to explore and exploit short RF pulses (sub-10 ns) to drive accelerating structures to higher gradients. The talk begins with an overview of the AWA facility and a motivation for the short-pulse approach. Research highlights presented include:

- **Power Generation.** Demonstration of X-band (11.7 GHz) two-beam acceleration (TBA) power extraction and transfer structures (PETS) based on both a conventional disk loaded waveguide (DLW) and metamaterials (MTM) to generate >500 MW RF pulses.
- **Acceleration.** Demonstration of X-band (11.7 GHz) TBA accelerating structures based on: dielectric disk accelerators (DDA), MTM structures, and a single-cell DLW structure with peak gradient reaching 300 MV/m.
- **Electron source.** Development of a sub-GV/m X-band photocathode gun with an unprecedented gradient of 400 MV/m on the photocathode surface.

These results demonstrate the potential of short-pulse RF to achieve high-gradient acceleration at AWA. The talk will conclude with future directions for short-pulse RF research at AWA.

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