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## Experimental investigation of zero transverse force modes in sub-THz dielectric lined waveguide

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Dielectric-lined waveguides have been extensively studied for high-gradient acceleration in beam-driven dielectric wakefield acceleration (DWFA) and for beam manipulations, including the application of zero transverse force modes in the waveguides. In this paper, we investigate the zero transverse force modes excited by a relativistic electron bunch passing through a dielectric waveguide with a rectangular transverse cross section. Numerical simulations were performed to optimize the start-to-end beamline using Opal-t, ELEGANT, and WARPX. A Longitudinal Phase Space (LPS) measurement system is used to understand the interaction of the beam with the waveguide modes, and analysis of the resolution of the LPS system was conducted. We will discuss preliminary experimental data collected at the Argonne Wakefield Accelerator (AWA) benchmarked with the simulation results.

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