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Coupler design for THz DLW LINACs

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A promising approach for compact linear accelerators in the THz frequency range is based on dielectric-loaded waveguides (DLWs). Higher breakdown fields expected at THz frequencies should enable higher acceleration gradients. However, the accelerating mode of a cylindrical DLW (TM_{01}) is not the fundamental and only mode inside the waveguide at operating frequency. Therefore, a method is required to ensure excitation of the proper mode only. Here we present a coupler design to convert the guided electromagnetic TE_{10} mode in a rectangular waveguide to the TM_{01} mode of a cylindrical DLW. The symmetry of the structure and its feeding waveguides allow us to suppress all undesired modes and consequently increase the coupling efficiency to the desired mode. Moreover, this configuration shows an extremely wide bandwidth and low quality factor suggesting the coupler is also suitable for short THz pulses.

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Footnotes

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