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Cherenkov waveguide selection for THz production at the EuXFEL

The EuXFEL R&D project, STERN, aims to provide X-ray users with an accelerator-based THz source synchronized with the X-ray repetition rate. The main proposed THz generation method consists of electron beam wakefield excitation in Cherenkov waveguides. This work focuses on the design of a copper block that holds an array of waveguides to cover the radiation spectrum spanning from 300 GHz to 30 THz. These will include a variety of materials and dielectric layer thicknesses to vary the spectral contents of the excited TM modes. Additionally, driving the wakefield generation process with an off-axis electron beam causes the excitation of HE modes, which are of great interest to the user community and add to the spectral content of the THz pulse.

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