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Iris waveguide for low-losses THz radiation propagation over long distances

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We investigate an iris waveguide designed for installation in the long halls of free-electron laser facilities for THz radiation propagation for pump-probe experiments. We approach this problem theoretically and validate our results using numerical wavefront propagation techniques. An iris line, optimised for 3 THz, can propagate radiation over 370 m with a transmission coefficient (T) of 0.69. Furthermore, a line optimized for chosen energy transmits radiation even more effectively at higher frequencies, e.g., at 10 THz, T = 0.94, and it is practically lossless at 25 THz. It is important to note that radiation should be matched before entering the iris line to ensure minimal losses. The least loss is found in the fundamental mode of the iris line. We conclude our study by proposing preliminary design parameters for the THz propagation line at European XFEL.

Footnotes

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