



# Birefringence of small apertures for shaping ultrashort pulses

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For ultrashort pulses having different states of polarization, the experienced time delay when passing through small apertures is different. In the case of a small slit (or a circular aperture), we report a significantly stronger dispersion for the TE (or azimuthal) mode as compared to that for the TM (or radial) mode, creating a noticeable time delay between the two orthogonal polarization states, even for very thin apertures. The birefringent effect of small apertures is caused by waveguide mode dispersion. In essence, the propagation constant of the excited modes varies with wavelength differently for orthogonal polarization states: it increases with the incoming wavelength for TE (or azimuthal) and remains constant for TM (or radial) mode. A fundamental understanding of this phenomenon helps to explain, for example, the use of small apertures as wave plates. Furthermore, this effect can be exploited by tailoring the width and thickness of the aperture to obtain the desired pulse-shape and delay.

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