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Title:Terahertz bandwidth all-optical Hilbert transformers based on long-period gratings
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Abstract:A novel, all-optical design for implementing terahertz (THz) bandwidth real-time Hilbert transformers is proposed and numerically demonstrated. An all-optical Hilbert transformer can be implemented using a uniform-period long-period grating (LPG) with a properly designed amplitude-only grating apodization profile, incorporating a single πphase shift in the middle of the grating length. The designed LPG-based Hilbert transformers can be practically implemented using either fiber-optic or integrated-waveguide technologies. As a generalization, photonic fractional Hilbert transformers are also designed based on the same optical platform. In this general case, the resulting LPGs have multiple πphase shifts along the grating length. Our numerical simulations confirm that all-optical Hilbert transformers capable of processing arbitrary optical signals with bandwidths well in the THz range can be implemented using feasible fiber/waveguide LPG designs. © 2012 Optical Society of America.
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