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Achromatic metasurface optical components by dispersive phase compensation

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The replacement of bulk refractive elements with flat ones enables the miniaturization of optical components required for integrated optical systems. This process comes with the limitation that planar optics suffers from large chromatic aberrations due to the dispersion of the phase accumulated by light during propagation. We show that this limitation can be overcome by compensating the dispersion of the propagation phase with the wavelength-dependent phase shift imparted by a metasurface. We demonstrate dispersion-free multi-wavelength dielectric metasurface deflectors in the near-infrared and design an achromatic flat lens in the same spectral region. Our design is based on low-loss coupled dielectric resonators, which introduce a dense spectrum of modes to enable dispersive phase compensation. Achromatic metasurfaces will find applications as multi-band-pass filters, lightweight collimators, and chromatically-corrected imaging lenses.