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Abstract:The ability to retrieve information from different layers within a stratified sample using terahertz pulsed reflection imaging and spectroscopy has traditionally been resolution limited by the pulse width available. In this paper, a deconvolution algorithm is presented which circumvents this resolution limit, enabling deep sub-wavelength and sub-pulse width depth resolution. The algorithm is explained through theoretical investigation, and demonstrated by reconstructing signals reflected from boundaries in stratified materials that cannot be resolved directly from the unprocessed time-domain reflection signal. Furthermore, the deconvolution technique has been used to recreate sub-surface images from a stratified sample: imaging the reverse side of a piece of paper. © 2012 Optical Society of America.