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S R Lau* (lau@unm.edu), Mathematics and Statistics, MSC03 2150, 1 University of New Mexico, Albuquerque, NM 87131, and **R H Price**. *Multidomain spectral-tau method for the three-dimensional helically reduced wave equation*. Preliminary report.

Helical reduction of the ordinary wave equation yields a problem of mixed type. The associated operator is also featured in Beetle, Bromley, and Price's formulation of the helically reduced Einstein equations. We describe an iterative, multidomain, sparse, and spectral-tau method for solving the helically reduced wave equation on a doubly punctured domain in three-dimensions. On all subdomains we achieve a sparse representation of the relevant operator through the "integration preconditioning" of Coutsias, Hagstrom, Hesthaven, and Torres. We also describe further preconditioning techniques necessary to improve performance of the underlying iterative solver. (Received February 23, 2010)