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**Michael Parks** (mlparks@sandia.gov), Computer Science Research Institute, P.O. Box 5800, MS 1320, Albuquerque, NM 87185-1320, and **Kirk M. Soodhalter\*** (ksoodha@temple.edu), Department of Mathematics, 1805 North Broad Street, 6th Floor Wachman Hall, Philadelphia, PA 19122. *Block Krylov Subspace Recycling: Theory and Application in a Newton Iteration.*

The GCRODR algorithm (GMRES with subspace recycling) for linear systems, presented by Parks and colleagues [SIAM J. Sci Comput, 2006] has been shown to offer significant acceleration of convergence over restarted GMRES. The method is particularly effective when solving a slowly-changing sequence of linear systems. We derive a version of this algorithm for use in the block Krylov setting. We call this method block GCRODR (block GMRES with recycling). We then demonstrate this method's effectiveness as a solver embedded in a Newton iteration arising in fluid density functional theory, where we use our method to accelerate each Newton step through the introduction of fictitious right-hand sides. (Received September 19, 2011)