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Yuriy Shlapak* (yuriy.shlapak@uwc.edu), 2000 West 5th Street, Marshfield, WI 54449.

Comparative analysis of a few fast numerical schemes for finding positive and some sign-changing solutions to time-independent Gross-Pitaevskii type equations with general potentials.

In our talk we discuss and compare a few fast numerical schemes for finding positive and some sign-changing solutions to time-independent Gross-Pitaevskii type equations. We present both theoretical results on convergence of these schemes to certain types of solutions and the results of numerical experiments based on these schemes where we find certain types of solutions to Gross-Pitaevskii type equations with various types of potentials in two dimensions. The schemes that we discuss are based on the fixed point iteration and on the Newton method. In our numerical experiments we use a highly effective spectral method of discretizing our equations by collocation at zeros of Legendre polynomials. (Received September 21, 2011)