

## Filtering and Postprocessing with Prolates

Tatiana Levitina<sup>1</sup> and Erkki J. Brändas<sup>2</sup>

<sup>1</sup>Institut Computational Mathematics, Technische Universität Braunschweig, Pockelsstraße14,  
D-38106 Braunschweig, Germany

<sup>2</sup>Department of Physical and Analytical Chemistry, Quantum Chemistry, Box 518, SE-751 20,  
Uppsala, Sweden

A detailed account is given of a recent modification of the Filter Diagonalization technique that serves to analyze a signal spectrum within a selected energy range. Our approach employs as filtering the eigenfunctions of the Finite Fourier Transform, or prolates, which due to their special properties are superior to other filters. In particular, prolates are simultaneously band-limited and highly concentrated at a finite time-interval. Both features are acquired by the convolution of a band-limited function with a prolate, that permits the latter to be interpolated via the Walter and Shen sampling formula, which essentially simplifies the supplementary computations.