

**A μ -mode-based integrator for solving evolution
equations in Kronecker form**

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In this talk, we propose a μ -mode integrator for computing the solution of stiff evolution equations. The integrator is based on a d -dimensional splitting approach and uses exact (usually precomputed) one-dimensional matrix exponentials. We show that the action of the exponentials, i.e. the corresponding matrix-vector products, can be implemented efficiently on modern computer systems. We further explain how μ -mode products can be used to compute spectral transformations efficiently even if no fast transform is available. We illustrate the performance of the new integrator by solving three-dimensional Schrödinger equations, and we show that the μ -mode integrator can significantly outperform numerical methods well established in the field.

This is a joint work with Fabio Cassini, Lukas Einkemmer, Alexander Ostermann, and Franco Zivcovich.