

Seminar *Special time integrators*

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Karlsruhe Institute of Technology, Winter semester 2021/22

Topics and references

Oscillatory problems and problems with low regularity

- **Date:** [??] **Speaker:** to be announced
Error analysis of exponential integrators for oscillatory second-order differential equations
Reference: [GH06]
- **Date:** [??] **Speaker:** to be announced
Uniformly accurate numerical schemes for highly oscillatory Klein-Gordon and nonlinear Schrödinger equations
Reference: [CCLM15]
- **Date:** [??] **Speaker:** [??]
On time-splitting methods for nonlinear Schrödinger equation with highly oscillatory potential
Reference: [SZ20]
- **Date:** [??] **Speaker:** [??]
Uniformly accurate exponential-type integrators for Klein-Gordon equations with asymptotic convergence to the classical NLS splitting
Reference: [BFS18]
- **Date:** [??] **Speaker:** to be announced
Low Regularity Exponential-Type Integrators for Semilinear Schrödinger Equations
Reference: [OS18]

Dynamical low-rank approximation

- **Date:** [??] **Speaker:** to be announced
Dynamical low-rank approximation
Reference: [KL07]
- **Date:** [??] **Speaker:** to be announced
A projector-splitting integrator for dynamical low-rank approximation
Reference: [LO14]
- **Date:** [??] **Speaker:** to be announced
Time integration of symmetric and anti-symmetric low-rank matrices and Tucker tensors

Reference: [CL20]

Other topics

- **Date:** [???] **Speaker: to be announced**
On leapfrog-Chebyshev schemes
Reference: [CHS20]

Talks with the note “Speaker: [??]” are still available.

Most of the papers can be downloaded from the webpage of the journal. Please make sure that you have the final version of the paper, not the preprint version. Talks (60-75 minutes) can be given in English or German. We strongly recommend that students discuss the concept of their talk (outline, draft of the materials, etc.) with T. Jahnke not later than three weeks before their presentation.

References

- [BFS18] Simon Baumstark, Erwan Faou, and Katharina Schratz. Uniformly accurate exponential-type integrators for Klein-Gordon equations with asymptotic convergence to the classical NLS splitting. *Math. Comp.*, 87(311):1227–1254, 2018.
- [CCLM15] Philippe Chartier, Nicolas Crouseilles, Mohammed Lemou, and Florian Méhats. Uniformly accurate numerical schemes for highly oscillatory Klein-Gordon and nonlinear Schrödinger equations. *Numer. Math.*, 129(2):211–250, 2015.
- [CHS20] Constantin Carle, Marlis Hochbruck, and Andreas Sturm. On leapfrog-Chebyshev schemes. *SIAM J. Numer. Anal.*, 58(4):2404–2433, 2020.
- [CL20] Gianluca Ceruti and Christian Lubich. Time integration of symmetric and anti-symmetric low-rank matrices and Tucker tensors. *BIT*, 60(3):591–614, 2020.
- [GH06] Volker Grimm and Marlis Hochbruck. Error analysis of exponential integrators for oscillatory second-order differential equations. *J. Phys. A*, 39(19):5495–5507, 2006.
- [KL07] Othmar Koch and Christian Lubich. Dynamical low-rank approximation. *SIAM J. Matrix Anal. Appl.*, 29(2):434–454, 2007.
- [LO14] Christian Lubich and Ivan V. Oseledets. A projector-splitting integrator for dynamical low-rank approximation. *BIT*, 54(1):171–188, 2014.
- [OS18] Alexander Ostermann and Katharina Schratz. Low regularity exponential-type integrators for semilinear Schrödinger equations. *Found. Comput. Math.*, 18(3):731–755, 2018.
- [SZ20] Chunmei Su and Xiaofei Zhao. On time-splitting methods for nonlinear Schrödinger equation with highly oscillatory potential. *ESAIM Math. Model. Numer. Anal.*, 54(5):1491–1508, 2020.