



# Numerical Analysis Seminar

## Low Regularity Integrators for Semilinear Parabolic Equations with Maximum Bound Principles

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### Abstract

This work is concerned with structure-preserving, low regularity time integration methods for a class of semilinear parabolic equations of Allen-Cahn type. Important properties of such equations include maximum bound principle (MBP) and energy dissipation law; for the former, that means the absolute value of the solution is pointwisely bounded for all the time by some constant imposed by appropriate initial and boundary conditions. The model equation is first discretized in space by the central finite difference, then by iteratively using Duhamel's formula, first and second-order low regularity integrators (LRIs) are constructed for time discretization of the semi-discrete system. The proposed LRI schemes are proved to preserve the MBP and the energy stability in the discrete sense. Furthermore, some semi-discrete and fully-discrete error estimates are also successfully derived under the low regularity requirement that the corresponding exact solution is only assumed to be continuous in time. Numerical results show that the proposed LRI schemes can be more accurate and achieve better convergence than classic exponential time differencing (ETD) schemes, especially when the interfacial parameter approaches zero.

Date:	September 21, 2022 (Wednesday)
Time:	10:00 - 11:00am
Venue:	ZOOM: <a href="https://hku.zoom.us/j/">https://hku.zoom.us/j/</a> Meeting ID: 913 6532 3891 Password: 310656

*All are welcome*