DY 33: Nonlinear dynamics and pattern formation

Time: Friday 12:00–13:15 Location: H3

DY 33.1 Fri 12:00 H3

Electro-optics and pattern formation of a bent-core nematic phase — •Jana Heuer[1], Maria-Gabriela Tamba[2], Alexey Eremin[1], and Ralf Stannarius[1] — [1]Otto-von-Guericke-Universität Magdeburg, Institut für Experimentelle Physik — [2]Martin-Luther-Universität Halle, Institut für Physikalische Chemie

Nematic phases of bent-core liquid crystals behave basically different from common rodlike (calamitic) nematics concerning the electro-optics.

We study a twin mesogen consisting of a bent-core unit and a covalently bound rod-like part. This substance is studied in the classical splay Freedericksz geometry. The sample is sandwiched in a transparent cell with planar alignment and observed with polarizing microscopy while we apply an electric AC field.

Above a certain threshold voltage (splay Freedericksz transition) Bloch-Leger-Walls occur. From the large anisotropy of these walls with respect to the director easy axis one can determine the ratio between the bend and twist elastic constant of the substance, which is substantially larger than in common calamitic nematics.

A second issue concerns the formation of periodic structures above a second threshold voltage. This stripe pattern is similar to standard electroconvection of nematics with negative dielectric anisotropy and positive conductivity anisotropy except one fundamental property: The alignment of the rolls is parallel to the director easy axis instead of a perpendicular orientation. A characterization of these structures gives insight in the basic pattern forming mechanism.

DY 33.2 Fri 12:15 H3

Pattern Formation in Unidirectional Coupled Nonlinear Optical Systems — Guido Krüger and •Rudolf Friedrich — Institute for Theoretical Physics, University of Münster, Wilhelm-Klemm-Str. 9, 48149 Münster

We present theoretical and numerical studies of two unidirectional coupled optical single feedback mirror systems. A single optical single feedback mirror system (OSFMS) can exhibit various structures such as 8-fold quasipatterns, hexagons, squares or solitary structures. In our work we consider two unidirectional coupled OSFMS and study the emerging patterns in the second cell. Our main focus in this talk will be on the interaction of solitary objects and the interplay of solitary objects with 8-fold quasipatterns. The coupling of these patterns allows the creation of various new patterns, that do not exist in a single OSFMS.

DY 33.3 Fri 12:30 H3

Localized Subharmonic Waves in a Circularly Vibrated Granular Bed — •Andreas Götzendorfer[1], Daniel Svenšek[2], Christof Kruelle[1], and Ingo Rehberg[1] — [1]Experimentalphysik V, Universität Bayreuth — [2]Department of Physics, University of Ljubljana, Slovenia

Localized period doubling waves arise in circularly shaken granular beds contained in an annular channel. These solitary wave packets are accompanied by a locally increased particle density. The width and velocity of the granular wave pulse are measured as a function of the amount of material in the container. A continuum model for the material distribution, based on the measured granular transport velocity as a function of the bed thickness, captures the essence of the experimental findings.

DY 33.4 Fri 12:45 H3

Controlling the stability transfer between oppositely traveling waves and standing waves by inversion symmetry breaking perturbations — •Alexander Pinter, Manfred Lücke, and Christian Hoffmann — Institut für Theoretische Physik, Universität des Saarlandes, Postfach 15 11 50, D-66041 Saarbrücken

The effect of an externally applied flow on symmetry degenerated waves propagating into opposite directions and standing waves that exchange stability with the traveling waves via mixed states is analyzed. Wave structures that consist of spiral vortices in the counter rotating Taylor-Couette system are investigated by full numerical simulations and explained quantitatively by amplitude equations containing quintic coupling terms. The latter are appropriate to describe the influence of inversion symmetry breaking perturbations on many oscillatory instabilities with O(2) symmetry.

DY 33.5 Fri 13:00 H3

Ising and Bloch fronts in lattices of coupled forced oscillators. — •Ernesto Nicola[1] and Diego Pazó[2] — [1]Max-Planck-Institut für Physik komplexer Systeme, Noethnitzer Str. 38, D-01187 Dresden, Germany — [2]Instituto de Física de Cantabria (CSIC-UC), E-39005 Santander, Spain

The parametrically forced complex Ginzburg-Landau equation has been intensively studied since the seminal work by Coullet and coworkers [1]. This equation, which models a spatially extended medium, is bistable and admits fronts separating both states. These fronts can be of two types: Ising and Bloch. The Ising fronts are stationary and the Bloch fronts move with constant velocity. A transition between both fronts is observed as the intensity of the forcing is changed.

Systems in nature are very often discrete. Some examples of these kind of systems are arrays of coupled oscillators, spin systems and diverse biophysical systems. Here, we analyse the parametrically coupled Ginzburg-Landau equation on the lattice. Numerical simulations of this equation show a large variety of front types. Some of them are not present in the continuum case. We show that the dynamics and transitions between all these fronts can be captured by a normal form consisting of two ordinary differential equations.

[1] P. Coullet et al., Phys. Rev. Lett. 65, 1352 (1990).