DY 17: Poster I

Time: Tuesday 16:00–18:00 Location: Poster C

DY 17.1 Tue 16:00 Poster C

Temporal flooding of regular islands — Arnd Bäcker, •Lars Bittrich, and Roland Ketzmerick — Institut für Theoretische Physik, Technische Universität Dresden, 01062 Dresden, Germany

We investigate the time evolution of wave packets in systems with a mixed phase space where regular islands and chaotic motion coexist. If a wave packet is started in the chaotic sea, the weight on a quantized torus of the regular island increases with time until a saturation plateau is reached. We demonstrate this effect for the standard map. The saturation values vary from torus to torus with a maximum value corresponding to a uniform distribution of the wave packet. The complete transition can be quantitatively described in a universal way employing a random matrix model and regular-to-chaotic tunneling rates.

DY 17.2 Tue 16:00 Poster C

Effects of point-like perturbations in billiards — •Timur Tudorovskiy, Ruven Höhmann, Ulrich Kuhl, and Hans-Jürgen Stöckmann — Fachbereich Physik, Philipps-Universität Marburg, Renthof 5, D-35032 Marburg, Germany

We study two-dimensional cavities with antennas and scatterers, where they are treated as point-like perturbations. Using this approach we construct a scattering theory for cavities with one or more open transversal channels and several antennas. In the framework of this approach we were able to reproduce observable "wavefunctions" of the cavity with exactly degenerated state as well as with nearly degenerated states in the presence of one and two antennas [1]. The comparison with experimental data from microwave cavities shows a good agreement. The same idea allowed us to consider cavities with loops, where some antennas are connected. With time dependent point-like perturbations Floquet systems can be realized. We apply this theory for the periodically driven cavities.

[1] U. Kuhl, E. Persson, M. Barth, and H.-J. Stöckmann. Eur. Phys. J. B 17, 253 (2000).

DY 17.3 Tue 16:00 Poster C

Investigation of three-dimensional wave dynamical systems — •Stefan Bittner, Barbara Dietz, Thomas Friedrich, Maksim Miski-Oglu, Pedro Oria Iriarte, Achim Richter, and Florian Schäfer — Institut für Kernphysik, Darmstadt

Two different three-dimensional systems are studied. The first system is investigated experimentally. It consists of a flat, circular dielectric microwave resonator, an enlarged version of the resonators commonly used for microdisk lasers. The aim is to validate the principle of effective index of refraction as a simplified means to calculate the resonance frequencies of microdisk lasers. For this, the resonance frequencies of a flat microwave resonator made of Teflon were measured and compared with effective index of refraction calculations. Significant deviations between the measured and computed frequencies were found.

The second system is investigated theroretically. It is a 3D stadium billiard, which consists of two quarter cylinders that are rotated with respect to each other by 90 degrees. Its classical dynamics is chaotic and exhibits a few nongeneric periodic orbits. We introduce an analytic method for their treatment. Small deviations of the spectral properties from random matrix theory led to the discovery of stable orbits. We theoretically investigated the effect of the breaking of the symmetry existent for equal radii on spectral properties of the quantum billiard. It is shown that the classically abrupt change of the symmetry properties of the system is accompanied by a gradual change of the spectral properties of the quantum billiard.

DY 17.4 Tue 16:00 Poster C

The random phase hypothesis and the circular ensembles — •Rudolf A. Roemer[1] and Hermann Schulz-Baldes[2] — [1]Department of Physics and Centre for Scientific Computing, University of Warwick, Gibbet Hill Road, Coventry, CV4 7AL, UK — [2]Institut für Mathematik, Universität Erlangen-Nürnberg, Bismarkstrasse 1 1/2, 91054 Erlangen, Deutschland

A new type of a random phase hypothesis for multi-channel disordered wires is presented, stating that the random action of the symplectic transfer matrices on the Lagrangian planes has an isotropic invariant measure on the elliptic channels of the wire. When the Lagrangian planes are identified with the unitary matrices via the stereographic projection, these isotropic invariant measures become precisely those of Dyson's circular ensembles. This is numerically shown to hold at weak disorder regime in both metallic and localized regime of various physical models belonging to different universality classes.

DY 17.5 Tue 16:00 Poster C

Experimental results on open microwave billiards — Stefan Bittner, Barbara Dietz-Pilatus, Thomas Friedrich, Maksim Miski-Oglu, •Pedro Oria-Iriarte, Achim Richter, and Florian Schäfer — Institut für Kernphysik, Schlossgartenstrasse 9, 64289 Darmstadt

Scattering properties, time evolution and diffraction patterns are investigated in different open microwave billiards. In an open circular billiard with an attached waveguide the survival probability is computed by means of a method proposed by Hannay, Dittes and Müller. Also the famous single and double slit experiments are performed in a microwave billiard on the basis of future experiments with regular and chaotic dynamics. In another experiment presented we test the random matrix description of spectral fluctuations and show that this analysis serves as a tool to learn about the dynamics of a system in the regime of overlapping resonances. Finally, we report on the decay for short times of open mushroom billiards, which we investigated for both the classical and quantum.

DY 17.6 Tue 16:00 Poster C

New methods for determining Poincaré recurrence times — Roland Ketzmerick and •Matthias Michler — Institut für Theoretische Physik, Technische Universität Dresden, 01062 Dresden, Germany

The distribution of Poincaré recurrence times in Hamiltonian systems typically shows a power-law decay. This is due to the self-similar phase-space structure at the interface of regular and chaotic regions. It is still an open question if at large times this decay has a universal exponent and further numerical investigations are needed. The standard numerical approaches, however, waste most of the computing effort on the short time behaviour. We present two new methods for determining the Poincaré recurrence time statistics, which circumvent this disadvantage.

DY 17.7 Tue 16:00 Poster C

Critical parameters for the disorder-induced metal-insulator transition in FCC and BCC lattices — Andrzej Eilmes[1], •Andrea M. Fischer[2], and Rudolf A. Roemer[2] — [1]Department of Computational Methods in Chemistry, Jagiellonian University, Krakow, Poland — [2]Department of Physics and Centre for Scientific Computing, University of Warwick, Coventry CV4 7AL, UK

We use a transfer matrix method to study the disorder-induced metal-insulator transition. We take isotropic nearest neighbour hopping and an onsite potential with uniformly distributed disorder. Following previous work done on the simple cubic lattice, we perform numerical calculations for the face centred cubic (FCC) and body centred cubic (BCC) lattices, which are more common in nature. We obtain the localisation length from calculated Lyapunov exponents for different system sizes. This data is analysed using finite size scaling to find the critical parameters. We create an energy-disorder phase diagram for both lattice types, noting that it is symmetric about the band centre for the BCC lattice, but not for the FCC lattice. We find a critical exponent of approximately 1.5 to 1.6 for both lattice types for transitions occurring either at fixed energy or at fixed disorder, agreeing with results previously obtained for other systems belonging to the same orthogonal universality class. We notice an increase in critical disorder with the number of nearest neighbours, which agrees with intuition.

DY 17.8 Tue 16:00 Poster C

Spin Relaxation and Decoherence through Chaotic Coupling — •Marcus V. S. Bonança and Klaus Richter — Institut für Theoretische Physik, Universität Regensburg, D-93040, Germany

We present numerical results and also the strategy for analytical calculations of the dynamics of a spin 1/2 (or a two-level system) coupled to two degrees of freedom which classical dynamics is chaotic. The chaotic system plays the role of an environment for the spin. It has been shown in the literature that such low-dimensional chaotic systems can induce relaxation and decoherence processes in simple systems coupled to them. The motivation behind such works is to understand better the role played by the dynamics in those irreversible phenomena. Our goal is to investigate a relation between the origin of the spin relaxation and decoherence and the chaoticity even when quantum effects are taken into account in the environment dynamics. Starting from a product initial state for the whole system, we study the spin effective dynamics numerically and analytically. Path integral calculations in close analogy to the spin-boson model are performed. Semiclassical methods are used to incorporate quantum effects in the correlation functions of the chaotic system.

DY 17.9 Tue 16:00 Poster C

Multifractal Analysis of the Metal to Insulator Transition in the Three-Dimensional Anderson Model — Louella J. Vasquez[1], Alberto Rodriguez[1,2], and •Rudolf A. Roemer[1] — [1]Department of Physics and Centre for Scientific Computing, University of Warwick, CV47AL United Kingdom — [2]Departamento de Fisica Fundamental, Universidad de Salamanca, 37008 Salamanca, Spain

The wavefunctions at the metal to insulator transition (MIT) of a disordered system within the Anderson model of localization have been shown to be of multifractal nature. In this paper we use a multifractal analysis to compute for the singularity spectra of very large wavefunctions at the band center. We will show that the singularity spectrum at the MIT is independent of the system size. We compare our results with recent findings and the Wegener prediction.

DY 17.10 Tue 16:00 Poster C

Mesoscopic Coulomb Supersolid — Alexei Filinov[1], •Jens Böning[1], Michael Bonitz[1], and Yurii Lozovik[2] — [1]Institut für Theoretische Physik und Astrophysik, Christian-Albrechts-Universität, Kiel, Germany — [2]Institute of Spectroscopy of the Russian Academy of Sciences, Troitsk, Russia

When a few tens of charged particles are trapped in a spherical electrostatic potential at low temperature they form concentric shells resembling atoms. These “artificial atoms” can be easily controlled by varying the confinement strength. We analyze such systems for the case that the particles are bosons and find superfluid behavior which even persists in the solid state. We show that while in the liquid phase the superfluid fractions on different shells are similar, in the radially ordered, but orientationally disordered state, the shells contribute very differently. For clusters with hexagonal symmetry which have the highest stability against intershell rotation, the superfluid fraction in the core region is reduced and superfluidity may persist only at the boundary, as known from, e.g., crystal grains [1] and parahydrogen clusters [2]. In contrast, pronounced concentration of superfluidity in the cluster core is observed for $N = 21-23, 30-32$, and $N = 39-42$. This novel state of matter is a mesoscopic supersolid [3].

[1] S. Sasaki *et al.*, Science **313**, 1098 (2006)
[2] S. A. Khairallah *et al.*, Phys. Rev. Lett. **98**, 183401 (2007)
[3] A. Filinov, J. Böning, M. Bonitz and Yu E. Lozovik, arXiv:0711.1255

DY 17.11 Tue 16:00 Poster C

Decoherence in the central spin model (Gaudin model) — Michael Bortz[1], •Christian Schneider[2], Joachim Stolze[2], and Robert Stübner[2] — [1]Fachbereich Physik, TU Kaiserslautern, Germany — [2]Institut für Physik, TU Dortmund, Germany

The Gaudin (or central spin) model consists of a single spin-1/2 coupled to a bath of independent spins-1/2 by exchange interactions. The model may be used to describe the decoherence of an electron spin quantum bit in a quantum dot which is coupled to many nuclear spins by hyperfine interactions. In general the interactions are inhomogeneous, I.e. each bath spin couples to the central spin with a different strength. For isotropic (Heisenberg-like) couplings the energy eigenstates and eigenvalues may be determined by the Bethe Ansatz (BA). A general formula for the time dependence of the central spin polarization can be derived from the BA. In the special case of homogeneous couplings the model may be diagonalized directly (I.e. without the BA) even for uniaxially anisotropic (XXZ-type) couplings. We develop strategies for finding the necessary BA quantum numbers numerically. Then we discuss the behavior of the central spin for homogeneous and inhomogeneous couplings. We also consider different types of initial states, varying in spin polarization and degree of entanglement.

DY 17.12 Tue 16:00 Poster C

Quantum transport on small-world networks: A continuous-time quantum walk approach — Oliver Mülken, •Volker Pernice, and Alexander Blumen — Theoretische Polymerphysik, Universität Freiburg, D-79104 Freiburg

We consider the quantum mechanical transport of (coherent) excitons on small-world networks (SWN). The SWN are built from a one-dimensional ring of N nodes by randomly introducing B shortcuts in the form of additional bonds between them.

The exciton dynamics is modeled by continuous-time quantum walks, a quantum mechanical analog of continuous-time random walks. We evaluate numerically the ensemble averaged transition probability to reach any node of the network from the initially excited one. We observe that already a few connections obliterate the pattern of quantum carpets that is present for transport on a ring.

For sufficiently large B we find that the quantum mechanical transport through the SWN is, first, very fast, given that a limiting distribution of the transition probabilities is reached very quickly; second, that in contrast to the classical case, where the limiting value is $1/N$ for all nodes, the transport does not lead to equipartition, given that on average the exciton is most likely to be found at the initial node. The reason for this is to be found in the network's eigenstates, which are localized at the band edges, whereas inside the band they are quite delocalized, similar to the undisturbed network [1].

[1] O.Mülken, V.Pernice, A.Blumen, Phys. Rev. E (2007) in press

DY 17.13 Tue 16:00 Poster C

Quantum Dynamics of Nanomechanical Resonator Arrays — •Max Ludwig and Florian Marquardt — Arnold-Sommerfeld Center for Theoretical Physics, Center for NanoScience and Department of Physics, Ludwig-Maximilians Universität München, Munich, Germany

We investigate the nonequilibrium quantum dynamics of arrays of coupled nanoresonators, where the coupling constants can be tuned in a time-dependent manner. In our numerical simulations, we take into account dissipation effects via a Lindblad master equation approach, and discuss the influence of different initial state preparations. We visualize the dynamics in terms of the Wigner density evolution of the individual resonators.

DY 17.14 Tue 16:00 Poster C

Phase transition of the sub-Ohmic spin-boson model — •Andre Winter and Heiko Rieger — Theoretische Physik, Universität des Saarlandes, PF 151150, D-66041 Saarbrücken

We study the spin-boson model in the sub-Ohmic case via path integral Monte Carlo methods. An algorithm in continuous imaginary time is applied, which avoids the usual Trotter-discretization, that is supposed to violate the quantum-classical mapping to the long-range Ising spin chain with algebraically decaying interaction. The phase transition between localized and delocalized phase is investigated by finite size scaling procedures, which take the corrections to scaling incoming due to long-range interaction into account. Critical Exponents are determined in both the mean-field and the non-classical regime, divided by the bath exponent of the spectral function.

DY 17.15 Tue 16:00 Poster C

Decoherence of the electron spin of NV-centers in Diamond — •Florian Rempp, Philipp Neumann, Torsten Gaebel, Fedor Jelezko, and Jörg Wrachtup — 3. Physikalisches Institut, Universität Stuttgart, Germany

Nitrogen-vacancy color centers (NV-center) in diamond with proximal C13 nuclear spins are one of the promising candidates for solid state quantum computers. One of the main assets of the NV-center is the optical accessibility of single spins while showing long T2 times due to low residual spin density.

We compute the decoherence the electron spin of NV-centers in diamond for various configurations of nitrogen and C13 atoms in the surroundings of the center. By characterising the effects of the those finite environments we hope to achieve better understanding of the experimental reality. It may thus be possible to estimate natural limits to the usage of NV-centers as quantum processors and memory.

DY 17.16 Tue 16:00 Poster C

Coherence properties of photons emitted by single defect centers in diamond — •Anton Batalov, Christian Zierl, Petr Siyushev, Torsten Gaebel, Fedor Jelezko, and Jörg Wrachtup — 3. Physikalisches Institut, Pfaffenwaldring 57, D-70550 Stuttgart

Photon interference among distant quantum emitters is a promising method to generate large scale quantum networks. Interference is best achieved when photons show long coherence times. The nitrogen-vacancy (NV) defect center in diamond can be used as a source of single indistinguishable photons. Optically induced Rabi oscillations indicate a close to Fourier transform (i.e. lifetime) limited width of photons emitted even when averaged over minutes. The projected contrast of two-photon interference (0.8) is high enough to envisage the applications in quantum information processing. The time resolved two-photon interference (experiment in preparation) will allow one to describe the photons, emitted by a single NV, in a more direct manner.

DY 17.17 Tue 16:00 Poster C

Anomalous transport in disordered iterated systems — •Andreas Fichtner and Günter Radons — TU Chemnitz, D-09107 Chemnitz

Diffusive transport is not only a phenomenon arising from stochastic environmental forces, which act e.g. on a heavy particle. While this picture requires many degrees of freedom, one can find normal and, more interestingly, anomalous diffusion already in low dimensional systems such as random walks in quenched random environments. A class of recurrent random walks, for which properties of the so called Golosov-phenomenon had been proven, is known under the heading of Sinai diffusion. In our work we extend the discrete Sinai model to random walks with next-nearest neighbour transitions. Thereby a generalization of binary disorder guarantees recurrence [1].

For Sinai disorder the known results concern quantities such as the disorder averaged mean square displacement, the density of states of the propagator, and the size-dependence of the escape rate. For each of them one can define a characteristic exponent. We show numerically for our generalized model that these exponents exist likewise and seem to coincide [2]. Perturbation theory, which is exact in the Sinai case, enables calculating escape rates for significant larger systems. For our model we find as function of system size a transition from a large preasymptotic regime to the asymptotic behaviour in dependence on the system parameters.

[1] G. Radons Physica D **187** (2004) 3.
[2] A. Fichtner, G. Radons New J. Phys. **7** (2005) 30.

DY 17.18 Tue 16:00 Poster C

Absolute negative mobility of an inertial Brownian particle — •David Speer[1], Joachim Nagel[2], Tobias Gaber[2], Ralf Eichhorn[1], Peter Reimann[1], Reinhold Kleiner[2], and Dieter Koelle[2] — [1]Universität Bielefeld, Fakultät für Physik, 33615 Bielefeld, Germany — [2]Universität Tübingen, Physikalisches Institut - Experimentalpysik II, 72076 Tübingen, Germany

We consider a single inertial Brownian particle in a symmetric periodic potential. Recently [1,2], it was shown that such a system is likely to exhibit absolute negative mobility (ANM), once thermal equilibrium is broken by a time-periodic force. E.g. the particle climbs uphill against a static tilt of the potential. The effect is due to noisy chaos in the model. We give an intuitive explanation, explain related effects, explore the the parameter region associated with ANM and consider generalizations of the model. Recent experiments [3] with Josephson Junctions show very good agreement with our predictions.

[1] L. Machura et al., Phys. Rev. Lett. 98, 040601 (2007).
[2] D. Speer et al., Europhys. Lett. 79, 10005 (2007), D. Speer et al., Phys. Rev. E 76, 051110 (2007).
[3] J. Nagel et al., in preparation.

DY 17.19 Tue 16:00 Poster C

Stochastic dynamics in a continuous disordered potential — •Steffen Röthel — Westfälische Wilhelms-Universität Münster, Institut für Theoretische Physik, Wilhelm-Klemm-Str. 9, 48149 Münster

We consider the behavior of an overdamped charged particle moving in a disordered potential in the presence of an external electric field under the influence of a Gaussian white noise. By applying periodic boundary conditions for the disordered potential a Fokker-Planck treatment of the corresponding Langevin equation allows to determine the the current density for various temperatures. The current depends on the electric field as well as on the statistical characteristics of the disordered potential in form of the potential increment. The experimental determination of the current-voltage relation can be used to identify properties of the disordered potential, and, in turn, to characterize the spatial structure of the material probe.

DY 17.20 Tue 16:00 Poster C

Correlations in the Sequence of Residence Times — •Benjamin Lindner[1] and Tilo Schwalger[2] — [1]Max-Planck-Institute for the Physics of Complex Systems, Dresden, Germany — [2]Humboldt-Universitaet Berlin, Berlin, Germany

Sequences of residence times (RTs) associated with the escape from metastable states are observed in many fields. Here, we study analytically and numerically the correlations among RTs for a bistable stochastic system driven by dichotomous noise. Our theory predicts an oscillatory behavior of the correlations with respect to the lag between RTs. Correlations vanish at all lags if the switching rate matches the hopping rate of the unperturbed system. It is also shown that RT correlations may reveal features of the driving which are not present in the single-RT statistics.

DY 17.21 Tue 16:00 Poster C

Interspike Interval Distribution of a Neuron Driven by Colored Noise — Tilo Schwalger[1,2], •Jessica Strefler[1], and Lutz Schimansky-Geier[1] — [1]Humboldt-Universität zu Berlin, Newtonstr. 15, 12489 Berlin — [2]RIKEN Brain Science Institute, Hirosawa 2-1, Wako, Saitama 351-0198, Japan

The interspike interval (ISI) density of the leaky integrate-and-fire neuron model driven by exponentially correlated Gaussian noise exhibits a dominant peak at small bursting intervals and a slow power-law decay of long interburst intervals. Due to this power-law decay, extreme ISIs have a large effect on the ISI statistics. This leads to a coefficient of variation which diverges as $t^{1/2}$ and an unexpected suppression of ISI correlations. This is in clear contrast to the colored noise effect in simpler neuron models, where the effect of noise correlations appeared in higher order statistical measures. Additionally, we study the impact of a dichotomous driving force.

DY 17.22 Tue 16:00 Poster C

Effect of noise and delay near a global bifurcation in superlattices — •Johanne Hizanidis and Eckehard Schöll — Institut f. Theor. Physik, Sekr. EW 7-1, Technische Universität Berlin, Hardenbergstr. 36, 10623 Berlin, Germany

We investigate the effect of time-delayed feedback control and Gaussian white noise on a semiconductor superlattice. Superlattices are spatially extended systems with complex dynamics of interacting fronts. The system is prepared in a regime where the deterministic dynamics is characterized by a global bifurcation, namely a saddle-node bifurcation on a limit cycle (*SNIPER*). Physically such a bifurcation governs the transition from stationary to traveling field domains through the device. The *SNIPER* is associated with excitability and therefore the phenomenon of coherence resonance can be verified in the addition of noise below the bifurcation: Noise forces stationary fronts to move and at an optimal noise intensity the regularity of the front motion exhibits a maximum. The possibility to control the noise-induced motion through time-delayed feedback comes into question next. But first the effect of delay without noise is considered. We are able to show that delay induces a homoclinic bifurcation. This result is in agreement to a generic model for the *SNIPER* with delay. Finally, with both noise and delay, we show how one is able to manipulate characteristic time scales of the system and enhance or deteriorate the coherene resonance effect.

DY 17.23 Tue 16:00 Poster C

Multiple time-delayed feedback control of stochastic dynamics in a resonant tunneling diode — •Niels Majer and Eckehard Schöll — Institut für Theoretische Physik, Technische Universität Berlin, Hardenbergstr. 36, 10623 Berlin, Germany

We study multiple time-delayed feedback control of noise-induced spatio-temporal oscillations in a double barrier resonant tunneling diode. The system is modeled by a set of partial differential equations of reaction-diffusion type with global coupling.

Below a Hopf bifurcation, Gaussian white noise sources and a multiple time-delayed feedback control force are applied to the system. Correlation times and timescales of the resulting noise-induced oscillations are investigated under variation of the control parameters. The obtained results are explained using the stability properties of the deterministic system.

DY 17.24 Tue 16:00 Poster C

Nonlinear hopping conduction in open channels — •Martin Körner[1], Mario Einax[1], Philipp Maass[1], and Abraham Nitzan[2] — [1]Institut für Physik, Technische Universität Ilmenau, 98684 Ilmenau, Germany — [2]School of Chemistry, The Sackler University of Science, Tel Aviv University, Tel Aviv 69978, Israel

The nonlinear conduction under the influence of strong static and oscillating electric fields is investigated based on an open channel model. In the model thermally activated hopping is considered on a linear chain connected to two particle reservoirs with different electrochemical potentials. An analytical expression for the stationary current is derived and tested against numerical calculations. In particular we discuss the behaviour of the nonlinear dc-current in the thermodynamic limit. A systematic scheme for analyzing the response to strong oscillating fields is presented and numerical results for frequency-dependent nonlinear conductivities are compared to measurements on thin-film glassy electrolytes.

DY 17.25 Tue 16:00 Poster C

Erzeugung von dynamischen Verkehrszustandsgrenzen für Online-Verkehrssimulationen — •Florian Mazur, Thomas Zaksek, Johannes Brügmann und Michael Schreckenberg — Universität Duisburg-Essen, Physik von Transport und Verkehr, Lotharstr. 1, D-47057 Duisburg, Germany

Die bisherige Einteilung der Verkehrszustände anhand der Anzahl Fahrzeuge und anhand ihrer Geschwindigkeiten in 4 Verkehrszustände ist nach der MARZ statisch auf eine Richtgeschwindigkeit von 130 km/h ausgelegt. Eine besondere Bedeutung innerhalb des Algorithmus hat die Geschwindigkeit 80 km/h. Ein Verkehrsaufkommen von 40 Fahrzeugen mit durchschnittlicher Geschwindigkeit von 79 km/h entspricht zähfließendem Verkehr. Bei einer Durchschnittsgeschwindigkeit von 81 km/h entspricht dieser dichtem Verkehr. Besonders in Bereichen mit niedrigeren Höchstgeschwindigkeiten, wie zum Beispiel im Bereich von Baustellen oder auf Autobahnen mit Verkehrsbeeinflussungsanlagen, führt diese Einteilung schnell zu nicht plausiblen Ergebnissen.

Dieses Poster zeigt einen Algorithmus, mit dem die Verkehrszustände auf Streckenabschnitten mit bestehenden statischen Geschwindigkeitsbeschränkungen genauer, d. h. realitätskonformer abgebildet werden können.

DY 17.26 Tue 16:00 Poster C

Entwicklung von Standardganglinien im Bereich von Baustellen für Online-Verkehrssimulationen — •Thomas Zaksek, Florian Mazur, Johannes Brügmann und Michael Schreckenberg — Universität Duisburg-Essen, Physik von Transport und Verkehr, Lotharstr. 1, D-47057 Duisburg, Germany

Im Bereich von Baustellen ist es schwierig, genaue Informationen über den Verkehrszustand auf diesem Abschnitt zu erhalten. Meist sind die automatischen Erfassungsanlagen abgeschaltet und nur sehr selten Ersatzdetektionsgeräte aufgestellt. Besonders in diesen Bereichen ist jedoch eine zuverlässige Information über den Verkehrszustand besonders interessant, da die Stauwahrscheinlichkeit an Engpässen ansteigt. Hierzu wurden Ersatzganglinien aus historischen Daten der vergangenen Jahre entwickelt, die die Topologie der Baustelle und die Spurführung berücksichtigen. Kombiniert mit den Verkehrsinformationen vor und nach dem Bereich der Baustelle können deutlich genauere Verkehrsinformationen für die Baustelle selbst erzeugt werden.

Dieses Poster zeigt die Erstellung von Ersatzganglinien und die Systematik, die für die Auswahl der richtigen Ersatzganglinie angewendet wird.

DY 17.27 Tue 16:00 Poster C

Stationary Turing Patterns in the Diffusive Bazykin System — •Oliver Strebel — Handjerystr. 31 12159 Berlin

Recently McGehee et. al. [1] demonstrated the existence of Turing patterns in the diffusive Bazykin System within the framework of linear stabilty analysis. Time series from numerical integration of the parabolic Bazykin system underpinned this finding. In this study stationary Turing patterns of the time-independent elliptic Bazykin systemare calculated using fixed point methods.

The stability of various spatial modes is determined in the linear approximation. The stable modes emanating from the constant solution are continuated using numerical continuation methods [2]. They exhibit in course of the continuation gradually more anharmonic bahaviour. Numerical criteria for detecting tangent, pitchfork and Hopf bifurcations are employed [3]. These bifurcation points in turn are continuated numerically, giving a description of the systems behaviour in the parameter space.

[1] E. A. McGehee et al., Phys. Lett. A342 90 (2005) [2] E. L. Allgower and K. Georg, Numerical Continuation Methods, Springer (1990). [3] Yu. A. Kuznetsov, Elements of Applied Bifurcation Theory (3rd ed.), Springer AMS (2004).

DY 17.28 Tue 16:00 Poster C

Patterns of Chaos Synchronization — •Johannes Kestler, Anja Englert, and Wolfgang Kinzel — Theoretische Physik III, Universität Würzburg

Small networks of chaotic units which are coupled by their time-delayed variables, are investigated. In spite of the time delay, the units can synchronize isochronally, i.e. without time shift. Moreover, networks can not only synchronize completely, but can also split into different synchronized sublattices. These synchronization patterns are stable attractors of the network dynamics. In this contribution we present different networks with their associated behaviors and synchronization patterns.

DY 17.29 Tue 16:00 Poster C

Lyapunov spectral gap and branch splitting of Lyapunov modes in a "diatomic" system — •Hong-liu Yang and Günter Radons — Institute of Physics, Chemnitz University of Technology, D-09107 Chemnitz, Germany

Lyapunov instability of a "diatomic" system of coupled map lattices is studied and the dynamics of Lyapunov modes (LMs) is compared with phonon dynamics. Similar to the phonon case mass differences between neighbouring sites induce gaps in the Lyapunov spectrum and LMs split into two types correspondingly. An unexpected finding [1] is that contrary to the phonon case a nontrivial threshold value for the mass difference is required for the occurrence of the spectral gap and the splitting of LMs. A possible origin of such a nontrivial threshold value of mass differences is suggested.

[1] Hong-liu Yang and Günter Radons, Phys. Rev. Lett. 99, 164101 (2007).

DY 17.30 Tue 16:00 Poster C

When can one observe good hydrodynamic Lyapunov modes? — •Hong-liu Yang and Günter Radons — Institute of Physics, Chemnitz University of Technology, D-09107 Chemnitz, Germany

Inspired by recent results on differences in fluctuations of finite-time Lyapunov exponents between hard-core and soft-potential systems we surmise that partial domination of the Oseledec splitting (DOS) with respect to subspaces associated with near-zero Lyapunov exponents is essential for observing good hydrodynamic Lyapunov modes (HLMs). Numerical results for coupled map lattices are presented to show the importance of DOS for observing good HLMs. This is achieved by relating splitting parameters to the maximum value of the Lyapunov mode structure factor.

DY 17.31 Tue 16:00 Poster C

Hydrodynamic Lyapunov modes and strong stochasticity threshold in the dynamic XY model: an alternative scenario — •Hong-liu Yang and Günter Radons — Institute of Physics, Chemnitz University of Technology, D-09107 Chemnitz, Germany

Crossover from weak to strong chaos in high-dimensional Hamiltonian systems at the strong stochasticity threshold (SST) was anticipated manifesting a global transition in the geometric structure of the phase space. Our recent study of Fermi-Pasta-Ulam (FPU) models showed that corresponding to the transition of the system dynamics at the SST the scaling of the energy density dependence of all Lyapunov exponents exhibits a similar change as the largest one. Also the profiles of change of all Lyapunov exponents are identical apart from an energy density independent scaling factor. The current investigation of the dynamic XY model discovers an alternative scenario of change of the system dynamics at SSTs. Although the tendency of change of all Lyapunov exponents is similar the detailed profiles are different from each other except in the near-harmonic regime. Such a finding restricts the use of only crude indices such as the largest Lyapunov exponent and the Ricci curvatures to characterize the global transition in dynamics of high-dimensional Hamiltonian systems. Moreover, numerical simulations demonstrate the existence of HLMs in the dynamic XY model and show that there is a smooth transition in the energy density dependence of significance measures of HLMs corresponding to the crossover in Lyapunov exponents.

DY 17.32 Tue 16:00 Poster C

Hydrodynamic Lyapunov modes in binary 1D-Lennard-Jones fluids — •Christian Drobniewski and Günter Radons — TU-

Chemnitz 09107

Corresponding to the partial structure factors of molecular hydrodynamics we defined static and dynamic correlation functions of the Lyapunov vectors ([1],[2]). By this it was made possible to identify Lyapunov modes in chaotic many particle systems with softcore interactions (Lennard-Jones fluids). Lennard-Jones fluids are a well know and widely treated class of systems which are often investigated in the context of the glass transition. With these correlation functions we open new investigation possibilities. For instance, the frequency properties for the Lyapunov modes allow the connection to the known properties of fluid or glasseous systems. We present results for a binary 1D-Lennard-Jones fluid with alternating masses. Special focus lies on the distinct properties shared with simpler model systems such as the linear chain or couple map lattices with alternating masses ([3]). To recognize differences in the behaviour of the particle sorts we splitted the above correlations functions for each of them. [1] Hong-liu Yang and Günter Radons, Hydrodynamic Lyapunov modes in coupled map lattices, Phys. Rev. E 73, 016202 (2006) [2] G. Radons and H. L. Yang, Static and Dynamic Correlations in Many-Particle Lyapunov Vectors, arXiv nlin. CD/0404028 [3] H.L. Yang, G. Radons, Lyapunov Spectral Gap and Branch Splitting of Lyapunov Modes in a Diatomic System, Phys. Rev. Lett. 99, 164101 (2007)

DY 17.33 Tue 16:00 Poster C

Dimensional collapse and fractal properties of simple maps with fluctuating delay times — •Jian Wang, Hong-liu Yang, and Günter Radons — Institute of Physics, Chemnitz University of Technology, D-09107 Chemnitz, Germany

Delay systems used to model retarded actions are relevant in many fields such as optics, mechanical machining, biology or physiology. A frequently encountered situation is that the length of the delay time changes with time. In this study we use a simple map system to investigate the influence of the fluctuating delay time on the system dynamics. A characteristic feature of such systems is that the dimension of the system dynamics collapses due to the fluctuation of the delay times. This implies infinite contraction rates therby leading to diverging Lyapunov exponents. The consequences of the latter for the fractal attractor dimensions are discussed.

DY 17.34 Tue 16:00 Poster C

Dynamical characterization of Markov processes with varying order — •Michael Bauer and Günter Radons — Chemnitz University of Technology, 09107 Chemnitz, Germany

Our objective is to characterize the behavior of discrete-time Markov processes with randomly fluctuating order in a finite state space. Such processes may arise e.g. in the symbolic dynamics of dynamical systems with varying memory length. Changing the order leads to different transition matrices, resulting for the evaluation of block probabilities in random products of matrices with different ranks, which have to be applied to the initial state. We calculate numerically the Lyapunov exponents of the random matrix product and the Kolmogorov-Sinai entropy for a sequence of symbols generated by such a time-variant Markov chain. In special cases this can be done analytically. We also provide results for the distribution of the state probabilities of such a non-stationary process. A connection is made to special hidden Markov models thereby providing results also for the latter.

DY 17.35 Tue 16:00 Poster C

Hamiltonian dynamics in a one-dimensional, spatially quenched random potential — •Ines Hartwig — Technische Universität Chemnitz

The Chirikov-Taylor standard map is modified by introducing a one-dimensional quenched random – yet analytic – potential. Besides having Gaussian autocorrelation, the potential also is Gaussian distributed. In order to define a fundamental cell in Hamiltonian phase space, the potential is made periodic. Finite-size effects created by this periodicity are considered.

The dependence of phase space structures and transport properties both on the period of the potential and the perturbation strength of the map are investigated. Diffusion exponents for transport in the momentum as well as the spatial coordinate are determined and compared to the standard map under corresponding perturbation. Enhanced transport for the random case is shown.

Crude estimates for the critical perturbation strenghts for the destruction of the last KAM-curve are found. Their frequency distribution over many realizations of the random potential is presented.

DY 17.36 Tue 16:00 Poster C

Nonlinear Dynamics of Coupled Hysteretic Transducers of Preisach-Type — •Andreas Zienert and Günter Radons — Chemnitz University of Technology, D-09107 Chemnitz

Hysteresis plays an important role in science and engineering. Many physical and technical systems such as ferromagnetic materials, shape memory alloys, or certain friction models are characterized by hysteretic behavior, implying e.g. a complex dependence on previous input events. The Preisach-model has proven to be an application independent tool for describing such systems.

We investigate the behavior of a series connection $y_n(t) = (\Gamma^n x)(t)$ of Preisach-hysteresis transducers Γ. We show that the outputs $y_n(t)$ for $n \to \infty$ always converge to multi-step functions jumping between two different values. In general $y_\infty(t)$ depends on the given input $x(t)$ and the special form of the Preisach-transducer Γ. A simple geometric method can be used to predict whether for a given Γ the limit output function $y_\infty(t)$ is input dependent. If this is not the case, the method can be used to determine $y_\infty(t)$ from $x(t)$.

DY 17.37 Tue 16:00 Poster C

Investigation of atrial fibrillation generating mechanisms — •Claudia Hamann, Mario Einax, and Philipp Maass — Institut für Physik, Technische Universität Ilmenau, Deutschland

Atrial fibrillation (AF) is the most common arrhythmia of the heart in the industrial countries. Different theories with respect to the generating mechanism of the fibrillatory state in the atria are discussed in the literature [1]: Single or multiple reentrant waves, stable or meandering spirals, action potentials circulating around tissue inhomogeneities, or the interference of a stable spiral in the left atrium with regular waves coming from the sinus node in the right atrium.
To probe these mechanisms we study the interplay between travelling action potentials and spatial inhomogeneities ("obstacles") on the basis of the FitzHugh-Nagumo-model [2]. Dependent on the form and characteristics of the obstacle various behaviours occur, for example, spiral waves can be bound to the obstacle, or they detach and meander through the system. We determine a phase diagram that differentiates the dynamical patterns with respect to the parameters characterising the extent and the physiological features of the obstacle.

[1] S. Nattel, Nature **415**, 219 (2002).

[2] R. FitzHugh, J. Gen. Physiol. **43**, 867 (1960).

DY 17.38 Tue 16:00 Poster C

Synchronization of a hierarchical ensemble of globally coupled excitable oscillators — •Cornelia Petrovic and Rudolf Friedrich — Institut für Theoretische Physik, Westfälische Wilhelms-Universität Münster

The presented work is motivated by the dynamics of the exothermic CO-oxidation on Palladium-supported catalyst [1]. In this experiment one can detect self-affine features in the temporal evolution of the system which are characterized by break-downs of the CO-conversion rate, due to break-downs of parts of the catalyst. We will present a model of an ensemble of globally coupled relaxation oscillators which is able to reproduce the most important characteristics which were experimentally observed. According to the model, these characteristics crucially originate from kind of synchronization phenomena.

[1] C.Ballandis, P.J.Plath, Journal of Non-Equilibrium Thermodynamics 25 3/4, 301 (2001)

DY 17.39 Tue 16:00 Poster C

Weather Roulette—Game Theoretical Concepts For Evaluating Forecasts — •Jochen Bröcker[1], Mark Roulston[2], and Leonard Smith[3] — [1]Max Planck Institute for the Physics of Complex Systems, Dresden, Germany — [2]London School of Economics, London, United Kingdom — [3]Met Office, Exeter, United Kingdom

Probabilistic forecasts are (at least in principle) superior to deterministic forecasts, as the former allow for a better assessment of potential risks. In weather and climate for example, probabilistic forecasts have therefore been a longstanding aim. In these sectors, the use of ensembles to convey probabilistic information has become more and more common.

Different from deterministic forecasts, probabilistic forecasts (ensemble forecasts or other) cannot simply be evaluated by just how far they missed truth. But how do we know then if our probabilistic forecast is "good"? In this contribution, concepts for evaluating probabilistic forecasts are discussed. Using a game theoretic approach, we investigate the income stream the forecast would generate in a lottery–like setup named "weather roulette". Thus the value of the forecast is measured directly in terms of money.

We discuss to what extend a good performance in weather roulette portends general virtues of a forecast. It turns out that, when implemented correctly, weather roulette does not encourage hedging. Numerical results are presented using ensemble weather forecasts for temperature and pressure at several locations.

DY 17.40 Tue 16:00 Poster C

Understanding Oscillatory Zoning in binary solid solution — •Tanja Mues and Andreas Heuer — Institut für physikalische Chemie, Universität Münster, 48149 Münster

Oscillatory Zoning (OZ) is a phenomenon common to many geologically formed crystals. A model of OZ in a binary solid solution grown from an aqueous solution can be described by a system of nonlinear partial differential equations, which were analysed in one dimension in the past. It combines species diffusion in the solution, particle adsorption, surface diffusion and subsequent desorption and incorporation into the crystal. We expand this scheme to two dimensions and check whether the growth behavior displays new characteristics as compared to the 1D case. In particular we elucidate whether the growth pattern is homogeneous, i.e. does not display concentration fluctuations along the surface and whether the limits of stability, obtained for the 1D case, still hold. This is checked via a linear stability analysis as well as a numerical simulation of the partial differential equations.

DY 17.41 Tue 16:00 Poster C

External noises effects on the spatiotemporal characterization of ensemble prediction systems — •Jorge Revelli, Miguel Rodriguez, and Horacio Wio — Instituto de FIsica de Cantabria, Santander, Spain

We investigate the effects of an external noise applied to anextended chaotic system. The chosen model is the Lorenz '96. The system is subjected to temporal and spatiotemporal perturbations. To approach to climate problems the studied system is characterized by three main components. A control, ensemble and reality trajectories. Ensemble trajectories are the result of applying perturbations on the initial conditions to the control. The reality evolution is independent of the control trajectory.

We analyze the fluctuations obtained as differences between each member of the ensemble and the control trajectory and between control and reality trajectories. We use the MVL (Mean Variance of Logarithms) diagrams to represent the interplay and evolution of the fluctuations moments.

With the Talagrand diagram we check where the evolution of a given trajectory usually falls with respect to the ensemble data ordered in a predetermined way.

In this work we study the similarities and differences between these two methods of characterize spatiotemporal evolutions in systems subjected to different ways of applying the external noise to the system. The aim is to establish correspondences between them.

DY 17.42 Tue 16:00 Poster C

Migraine symptoms modeled as transient particle-like waves — Markus A. Dahlem, •M. Hannelore Frank, Gerald Hiller, and Eckehard Schöll — Institut f. Theor. Physik, Sekr. EW 7-1, Technische Universität Berlin, Hardenbergstr. 36, 10623 Berlin, Germany

In two-dimensional reaction-diffusion systems, the evolution of waves depends on their form (length and shape). For each set of parameters a specific particle-like wave form exists. When this form is perturbed the momentarily excited area either grows or dies after a transient time. This defines a size limit for excitation spread of particular wave shapes. We show that close to this limit the reaction-diffusion model can be used to describe spatio-temporal patterns of pathological activity during migraine. Patients' symptom reports suggest that pathological activity breaks away from one side of a pathological core and vanishes after it has spread a certain distance. We model this by wave propagation initiated from a circular core region with a cut out wedge. We perform numerical simulations of transient waves breaking away from the core and match their evolution with data of affected cortical tissue obtained from the patients' symptom reports. In the model, we observe curvature effects arising due to the fact that the initial shape of the wave segments is higher curved than the natural form of particle-like waves. We investigate under what circumstances cortical geometry can cause a curvature-induced transition to non-excitable dynamics explaining not only the confined spread but also the partial excitation block at the opposite side of the pathological core.

DY 17.43 Tue 16:00 Poster C

Three-dimensional wave propagation in thin layers of a photo-sensitive BZ-medium — •Peter A. Kolski, Hermann Brandtstädter, and Harald Engel — Institut für Theoretische Physik, TU Berlin, Hardenbergstr. 36, D-10623 BERLIN

We study the dynamics of excitation waves in thin gel layers of the light-sensitive Belousov-Zhabotinsky (BZ) medium in the presence of an excitability gradient transverse to the direction of propagation. Due to Beer-Lamberts law the effective light intensity decreases exponentially with the depth into the layer. Three-dimensional numerical simulations of the underlying reaction-diffusion equations were performed to reveal experimentally observed complex pattern. Calculations were carried out using the Oregonator model modified to describe the photosensitive BZ reaction. The results provide insight into the mechanism of reflective wave collision close to the transition between excitable and oscillatory local kinetics. Inhibiting only parts of the layer leads to the formation of scroll waves and allows for the study of their dynamics in this constraint geometry.

DY 17.44 Tue 16:00 Poster C

Stabilized spiral waves between two excitability limits — •Jan Schlesner, Vladimir S. Zykov, and Harald Engel — Institut für Theoretische Physik, Technische Universität Berlin, Hardenbergstrasse 36, 10623 Berlin, Germany

Taking the FitzHugh-Nagumo as an representative example, rigidly rotating spiral waves are studied over the whole excitability range where spiral waves are supported. By external feedback control we inhibit the instability of rigid rotation and the transition to meandering motion. Under the feedback we determine the rotation frequency, the core radius and other characteristics of rigid rotation in a broad excitability range that includes the meander regime where rigid rotation is unstable. These numerical results are compared to theoretical predictions obtained within the framework of a kinematical approach. Up to now the agreement is encouraging: Both the scaling laws valid for weakly and strongly excitable media as well as the range of intermediate excitability values are reproduced fairly good.

DY 17.45 Tue 16:00 Poster C

Travelling and breathing dissipative solitons in a three-component reaction-diffusion system — •Svetlana V. Gurevich[1], Shalva Amiranashvili[2], Hans-Georg Purwins[3], and Rudolf Friedrich[1] — [1]Institute for Theoretical Physics, WWU Münster, 48149 Münster, Germany — [2]Weierstrass Institut for Applied Analysis and Stochastics, 10117 Berlin, Germany — [3]Institute of Applied Physics, WWU Münster, 48149 Münster, Germany

We are interested in stability of the localized solutions in a three component reaction-diffusion system with one activator and two inhibitors, which is considered as phenomenological model of the planar dc gas-discharge system with high-ohmic electrode operating in the glow mode. Here we consider the situation, where two critical modes become unstable simultaneously. In this case two control parameters are to be changed, so one can speak about codim=2 bifurcation point. This situation is analyzed performing a two-time-scale expansion in the vicinity of the bifurcation point. Also numerical simulations are carried out showing good agreement with the analytical predictions.

DY 17.46 Tue 16:00 Poster C

Hopf-bifurcations in systems with conserved quantities — •Markus Hilt and Walter Zimmermann — Theoretische Physik I, Universität Bayreuth, 95440 Bayreuth, Germany

A cubic Ginzburg-Landau equation is presented, which describes the universal properties of a Hopf-bifurcation in a system with conserved quantities. It is a universal feature of the equation that all traveling wave solutions are linear unstable. In finite systems with periodic boundary conditions only the solution with the longest possible wavelength is stable in some parameter range. This is different from the behavior of a Hopf-bifurcation in systems with an unconserved order parameter.

We present four typical solution scenarios of this universal equation. In addition we show that the typical nonlinear coarsening behavior in such systems may be suppressed by temporal forcing whereby a wavelength range is selected which depends on the forcing frequency.

DY 17.47 Tue 16:00 Poster C

Implementation of a microscopic simulation model for urban traffic — •Daniel Weber and Michael Schreckenberg — Physik von Transport und Verkehr, Universität Duisburg-Essen

We present a microscopic traffic flow model derived from the Nagel-Schreckenberg cellular automaton. This model is implemented for a realistic urban traffic topology, featuring multiple lanes, varying speed limits and junctions with and without traffic signals. Local flow and velocity measurements are used as input or the simulation to compute travel-times and level-of-service for the whole network. We show results of the calibration and validation of the simulation using data of detectors and test drives.

DY 17.48 Tue 16:00 Poster C

On multiplicative forcing effects in the Cahn-Hilliard model — •Christian Feller, Alexei Krekhov, and Walter Zimmermann — Theoretische Physik I, Universität Bayreuth, 95440 Bayreuth, Germany

Phase separation in the presence of spatially periodic temperature modulation has been investigated theoretically in terms of a generalized Cahn-Hilliard model, where the temperature modulation is described by a spatially periodic modulation $G\cos(Qx)$ of the control parameter.

One obtains for harmonic and subharmonic solutions with respect to the modulation of the control parameter different thresholds for the bifurcation from the basic state. The threshold for the harmonic solutions is always lower. Beyond the threshold there exists a discrete set of periodic solutions characterized by the wave number Q/m (with integer m) which become stable only beyond a certain second threshold. In the nonlinear regime numerical simulations of the phase separation dynamics in one and two dimensions are compared with the results of linear stability analysis.

DY 17.49 Tue 16:00 Poster C

Conversion of Stability in Systems close to a Hopf Bifurcation by Time-delayed Coupling — Chol-ung Choe[1,2], Valentin Flunkert[2], •Philipp Hövel[2], Hartmut Benner[3], and Eckehard Schöll[2] — [1]Department of Physics, University of Science, Unjong-District, Pyongyang, DPR Korea — [2]Institut f. Theo. Physik, Sekr. EW 7-1, Technische Universität Berlin, Hardenbergstr. 36, 10623 Berlin, Germany — [3]Institut für Festkörperphysik, Technische Universität Darmstadt, 64289 Darmstadt, Germany

We propose a control method with time delayed coupling which makes it possible to convert the stability features of systems close to a Hopf bifurcation. We consider two delay-coupled normal forms for Hopf bifurcation and demonstrate the conversion of stability, i.e., an interchange between the sub- and supercritical Hopf bifurcation. [1] The control system provides us with an unified method for stabilizing both the unstable periodic orbit and the unstable steady state and reveals typical effects like amplitude death and phase locking. The main method and the results are applicable to a wide class of systems showing Hopf bifurcations, for example, the Van der Pol oscillator. The analytical theory is supported by numerical simulations of two delay-coupled Van der Pol oscillators, which show good agreement with the theory.

[1] C.-U. Choe *et al.*, Phys. Rev. E **75**, 046206 (2007).

DY 17.50 Tue 16:00 Poster C

Synfire chains in Integrate-and-fire networks with unreliable synapses — •Johannes Friedrich and Wolfgang Kinzel — Institute of Theoretical Physics and Astrophysics, University of Würzburg, Am Hubland, Würzburg, Germany

There is experimental evidence that synapses transmit an incoming spike not deterministically but with some probability which may be as low as a few percent. We investigated the properties of a network of identical integrate-and-fire neurons with unreliable inhibitory synapses which transmit with a delay time.

Without temporal delay, the network relaxes to a state of high attention: Most of the neurons collect just below threshold and are prepared to react immediately to an incoming excitation.

With time delay the network relaxes to a state with clusters, or synfire chains. The whole network consists of clusters of identical size which are stable, instead of the probabilistic nature of the synapses. The number of clusters does not depend on the probability p of synaptic transmission, but their survival time decreases with decreasing p. The number of possible configurations of synfire chains increases exponentially with the size of the network.

Ref: Wolfgang Kinzel, J Comput Neurosci DOI 10.1007/s10827-007-0049-3

DY 17.51 Tue 16:00 Poster C

Stabilizing odd-number orbits close to a saddle-node bifurcation by time-delayed feedback control — •Valentin Flunkert[1], Bernold Fiedler[1], Philipp Hövel[2], Marc Georgi[2], and Eckehard Schöll[1] — [1]Institut für Theoretische Physik, Technische Universität, Berlin — [2]Institut für Mathematik I, Freie Universität, Berlin

We demonstrate by a simple normal form model that an unstable periodic orbit generated by a saddle-node bifurcation can be stabilized using time-delayed feedback control.

This furnishes a further example, besides the subcritical Hopf bifurcation [1], that the alleged "odd number limitation theorem", which states that orbits with an odd number of positive Floquet multipliers greater than unity cannot be stabilized by Pyragas time-delayed feedback, does not hold.

We analyse the stability regions of our model in the parameters space and investigate the mechanism of stabilization.

[1] B. Fiedler, V. Flunkert, M. Georgi, P. Hövel, and E. Schöll, Phys. Rev. Lett. **98**, 114101 (2007).

DY 17.52 Tue 16:00 Poster C

Influence of noise on time-delayed feedback control — Tine Brülle, •Klaus Höhne, Markus Appel, and Hartmut Benner — Institut für Festkörperphysik, TU Darmstadt

Time-delayed feedback control is a convenient tool to control chaos in dynamical systems. While the control mechanism is meanwhile well understood and even the role of global properties is presently discussed, the influence of noise on the control performance has still remained an open question. To fill this gap we made control experiments on the diode resonator, which previously has been used as a paradigm to study time-delayed feedback control techniques. Applying different types of noise (additive and multiplicative noise in the controlled system and multiplicative noise in the control loop) we probed the size of the control interval with increasing noise level. The controlled system turned out to be very robust and the control regime was decreased only by very strong noise. Our experimental results were supported by numerical simulations, underlining their general relevance.

DY 17.53 Tue 16:00 Poster C

Mechanisms of the reflection of water jets on superhydrophobic surfaces — •Michael Scharnberg[1], Sören Kaps[2], Vladimir Zaporojtchenko[1], Srdjan Milenkovic[3], Achim Walter Hassel[3], Franz Faupel[1], and Rainer Adelung[2] — [1]Lehrstuhl für Materialverbunde, Institut für Materialwissenschaft, CAU Kiel — [2]Funktionelle Nanomaterialien, Institut für Materialwissenschaft, CAU Kiel — [3]Max-Planck-Institut für Eisenforschung, Düsseldorf

After impinging onto biological and artificial superhydrophobic surfaces water jets are observed to flow across the surface for a distance equal to several jet diameters before they are reflected off the surface as coherent jets under an angle that is close to or smaller than the angle of incidence. The influence of the water jet's velocity and angle of incidence on this intriguing phenomenon was examined in order to further the understanding of the physics involved. Based on the experimental data a simple theoretical model was derived which will be discussed as well as possible applications in microfluidics.

DY 17.54 Tue 16:00 Poster C

Lagrangian statistics in forced two-dimensional turbulence — •Oliver Kamps and Rudolf Friedrich — Institute for Theoretical Physics, University of Muenster

In recent years the Lagrangian description of turbulent flows has attracted much interest from the experimental point of view and as well is in the focus of numerical and analytical investigations. We present detailed numerical investigations of Lagrangian tracer particles in the inverse energy cascade of two-dimensional turbulence. In the first part we focus on the shape and scaling properties of the probability distribution functions for the velocity increments and compare them to the Eulerian case and the increment statistics in three dimensions. Motivated by our observations we address the important question of translating increment statistics from one frame of reference to the other [1]. To reveal the underlying physical mechanism we determine numerically the involved transition probabilities. In this way we shed light on the source of Lagrangian intermittency.

[1] R. Friedrich, R. Grauer, H. Hohmann, O. Kamps, A Corrsin type approximation for Lagrangian fluid Turbulence , arXiv:0705.3132

DY 17.55 Tue 16:00 Poster C

Anomalous transport in turbulent systems — •Holger Zimmermann[1], Rudolf Friedrich[1], and Frank Jenko[2] — [1]Institut für Theoretische Phyisk, WWU Münster, Germany — [2]Max-Planck-Institut für Plasmaphysik, 85748 Garching, Germany

Patterns and coherent structures in self-organizing turbulent systems have considerable impact on the transport properties of particles. We investigate a simple model to describe pattern formation in plasma core turbulence. It shows the basic patterns observed in plasma turbulence. These are zonal flows, for the case of ion temperature gradient (ITG) driven turbulence, respectively streamers for electron temperature gradient (ETG) driven turbulence. For the sake of simplicity, a two dimensional model, consisting of two coupled partial differential equations, is considered. In addition, the transport of test particles is also computed for the random forced Burgers equation, which serves as a simple model system for fluid turbulence. Comparable to the coherent structures in the plasma system, this system shows the formation of shocks.

DY 17.56 Tue 16:00 Poster C

Structure of the offshore wind profile of the boundary layer. — •Allan Morales and Joachim Peinke — Physhics Institute, Oldenburg University

From high frequency (1-50Hz) wind and temperature offshore measurements from the research platform in the north sea FINO I , it is possible to get a better understanding of the complexity of wind fields. We analyze these data with respect to high frequency instabilities. As a characteristic parameter we calculate the instantaneous thermal stability of the meteorological boundary layer by means of the Richardsons number. We use these results to get a better, more detailed description of the mean wind profile of the boundary layer. In particular we consider the 10 min. wind profile as a nonstationary superposition of different wind profile situations.

DY 17.57 Tue 16:00 Poster C

A Comparison of Turbulent and Random Fields — •Michael Wilczek[1], Holger Homann[2], Rainer Grauer[2], and Rudolf Friedrich[1] — [1]Institute for Theoretical Physics, Westfälische Wilhelms-Universität Münster, Germany — [2]Institute for Theoretical Physics I, Ruhr-Universität Bochum, Germany

Fully developed turbulence is dominated by a complex tangle of vortex filaments. During their complicated interaction they produce an almost Gaussian velocity field and an energy spectrum according to Kolmogorov's classical prediction. By a randomization procedure we construct random, incoherent fields, which maintain these properties but lack of any signatures of coherent structures. Regarding Eulerian statistics a comparison of the coherent and incoherent fields reveals significant differences in one-point statistics like the pdf of vorticity, velocity and acceleration. An investigation of the statistical alignment of these fields confirms the picture of turbulence as an ensemble of tubular coherent structures. A comparison of the Eulerian structure function gives further insight to the relation between coherent structures and intermittency. Additionally we study the advection of tracer particles, focusing on Lagrangian structure functions. We find that the scaling properties significantly differ in both cases, consistent with the observations in the Eulerian frame.

DY 17.58 Tue 16:00 Poster C

Buoyancy-driven hydrodynamic instabilities of chemical reaction fronts — •Lenka Šebestíková and Marcus J. B. Hauser — Otto von Guericke Universität Magdeburg, Institut für Experimentelle Physik, Abteilung Biophysik, Magdeburg

Experimental results on buoyancy-driven hydrodynamic instabilities taking place in a liquid system made of two miscible fluids that are separated by a traveling reaction front are presented. The experiments have been performed in a rectangular-shaped channel, whose top was open to air, allowing for gas/liquid interfaces. The reaction fronts propagate with a certain speed through the channel showing a dependence of the liquid depth on the speed of a propagating reaction front. The liquid depth also affects the dynamics of the system leading to a new type of pattern formation, reminiscent of turbulence patterns. A critical liquid depth for the development of the new type of patterns was determined. We will discuss a possible relationship of the turbulence-like pattern formation and the development of hydrodynamic convection rolls accompanying the traveling reaction front.

DY 17.59 Tue 16:00 Poster C

Semiclassical Local Densities in One-Dimensional Systems — •Jerome Roccia and Matthias Brack — Institut für Theoretische Physik, Universität Regensburg, 93040 Regensburg, Germany

We investigate the local densities for non-interacting fermions in one dimensional potentials at zero temperature. Using the semiclassical Green's function, we study the particle and kinetic-energy densities close to the minimum of the potential. Without any knowledge of individual wave functions, we find a universal behavior as function of the position which depends only on the non periodic trajectories of the system. We give also a simple analytical formula for symmetric potentials.