

MP 2: Classical Field Theory

Zeit: Dienstag 9:00–9:40

Raum: 30.45: 201

MP 2.1 Di 9:00 30.45: 201

Combinatorics of KP line solitons: a tropical approach — FOLKERT MÜLLER-HOISSEN¹ and ●ARISTOPHANES DIMAKIS² — ¹Max-Planck-Institute for Dynamics and Self-Organization, Bunsenstrasse 10, D-37073 Göttingen — ²Department of Financial and Management Engineering, University of the Aegean, 41 Kountourioti Str., GR-82100 Chios

The Kadomtsev-Petviashvili (KP) equation in particular models certain network patterns formed by waves on shallow water in terms of line soliton solutions. The simplest class of such solutions corresponds, in a tropical approximation, to chains of rooted binary trees, and it turns out that they realize maximal chains in Tamari lattices (which are poset structures on associahedra). The analysis also makes contact with “higher-order” versions of Tamari lattices. A general line soliton network solution can be described, in good approximation, as a superimposition of solutions from the tree class, with rather simple modifications. All this yields a characterization of possible evolutions of wave network patterns on shallow water, provided that the KP approximation applies. It is based on our publication *J. Phys. A: Math. Theor.* 44 (2011) 025203.

MP 2.2 Di 9:20 30.45: 201

Fractal dynamics of ϕ^4 and ϕ^6 kinks. — ●YAKOV SHNIR — De-

partment of Physics, Carl von Ossietzky University Oldenburg

We discuss new results concerning chaotic dynamics in non-perturbative sectors of the classical one-dimensional ϕ^4 and ϕ^6 models. Considering the process of production of kink-antikink pairs in the collision of particle-like states we have shown that there are 3 steps in the process, the first step is to excite the oscillon intermediate state in the particle collision, the second step is a resonance excitation of the oscillon by the incoming perturbations, and finally, the soliton-antisoliton pair can be created from the resonantly excited oscillon. It is shown that the process depends fractally on the amplitude of the perturbations and the wave number of the perturbation. We also present the effective collective coordinate model for this process.

Considering the process of the kink-antikink collisions in the one-dimensional non-integrable scalar ϕ^6 model we reveal that, although the classical kink solutions for this model do not possess an internal vibrational model there is a resonant scattering structure of the process, thereby providing a counterexample to the common belief that existence of such a mode is a necessary condition for multi-bounce resonances in the kink-antikink collisions. We investigate the two-bounce windows in the velocity range and present evidence that this structure is entirely related to the spectrum of the bound states on the background of the combined kink-antikink configuration.