Regular and Chaotic Dynamics in Time-Dependent Relativistic Mean-Field Theory

D. Vretenar[a], P. Ring, G. A. Lalazissis, and W. Pöschl

[a] Physics Department, University of Zagreb, Zagreb, Croatia

Isoscalar and isovector monopole oscillations that correspond to giant resonances in spherical nuclei are described in the framework of time-dependent relativistic mean-field theory. Time-dependent and self-consistent calculations that reproduce experimental data on monopole resonances in ^{208}Pb show that the motion of the collective coordinate is regular for isoscalar oscillations, and that it becomes chaotic when initial conditions correspond to the isovector mode. Regular collective dynamics coexists with chaotic oscillations on the microscopic level. Time histories, Fourier spectra, state-space plots, Poincaré sections, autocorrelation functions, and Lyapunov exponents are used to characterize the nonlinear system and to identify chaotic oscillations. Analogous considerations apply to higher multipolarities.

published in Phys. Rev. **E56** (1997) 6418-6426

Relativistic Description of High Spin States

P. Ring and A. V. Afanasjev

Cranked relativistic mean field theory with a non- linear coupling of the σ- mesons field is used for a microscopic description of rotational bands in Super deformed nuclei. A systematic investigation of all measured yrast Super deformed bands in the A=140-150 mass region is presented. The agreement with experimental data is excellent.

published in Prog. Part. Phys. **38** (1997) 137-146

Relativistic Description of High Spin States

P. Ring and A. V. Afanasjev

Cranked relativistic mean field theory with a non- linear coupling of the σ- mesons field is used for a microscopic description of rotational bands in Super deformed nuclei. A systematic investigation of all measured yrast Super deformed bands in the A=140-150 mass region is presented. The agreement with experimental data is excellent.

published in Prog. Part. Phys. **38** (1997) 137-146

Reduction of the Spin-Orbit Potential in Light Drip-Line Nuclei

G. A. Lalazissis, W. Pöschl, P. Ring, and D. Vretenar[a]

[a] Physics Department, Faculty of Science, University of Zagreb, Croatia

The isospin dependence of the spin-orbit interaction in light neutron rich nuclei is investigated in the framework of relativistic mean field theory. The magnitude of the spin-orbit potential is considerably reduced in drip line nuclei, resulting in smaller energy splittings between spin-orbit partners. The effect does not depend on the parametrization of the effective Lagrangian. The results are compared with corresponding calculations in the non-relativistic Skyrme model.

to be published in Phys. Lett. **B**