the magnetic field has a hyperbolic-tangent profile. A Squire's theorem could be proven stating that two-dimensional perturbations become unstable first. By varying several parameters of the equilibrium, stability boundaries were determined. The unstable perturbations are tearing modes, characterized by current filaments, magnetic islands associated with them and a fluid motion in convection-like rolls. Restricting the problem to two spatial dimensions, the nonlinear evolution of the tearing modes was followed up to time-asymptotic steady states. These are linearly stable with respect to two-dimensional perturbations, but prove to be sensitive to three-dimensional ones even close to the primary bifurcation point. Again stability boundaries were determind by varying the system parameters. The unstably perturbed states were followed up in their three-dimensional nonlinear evolution.

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Some Properties of Transcendental Integrable Dynamical Systems

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It is well-known that the concept of integrability has the various aspects due to in what functions an integration is made (analytical, smooth, meromorphic etc.) [1,2]. In the given activity the problem of integrability of systems of ordinary differential equations in the class of transcendental functions, i.e. functions, after which prolongation in complex area they have essentially singular points is discussed [2]. Concept of integrability of the class of transcendental functions arises for the reason of availability of this system asymptotic (attracting or repelling) limited sets, i.e. sets that have the neighborhood which consist of diversities of dimensionality above 1.

In this paper, we touch upon some qualitative questions of the theory of ordinary differential equations important for study of dynamical systems. The lots of them are arising in dynamics of a rigid body interacting with a medium. We shall review such problems as existence of the so-called monotonic limit cycles, the existence of closed trajectories contractible to a point along two-dimensional surfaces, the existence of closed trajectories not contractible to a point along a phase cylinder, qualitative problems of the theory of topographical Poincare systems and more general systems for comparison with dynamical systems on a plane, the existence and uniqueness of trajectories which have infinitely remote points as limit sets for systems on a plane.

We are also dealing with the existence and uniqueness of trajectories of dynamical systems on a plane which have infinitely remote points as α- and ω-limit sets. So, on

Riemann or Poincare spheres, limit sets of such trajectories is the north pole. These are key trajectories by definition because an infinitely remote point is always singular [3-5].

Recall that in a phase space a trajectory is Poisson stable if in a finite time it returns to any sufficiently small neighborhood of its point.

Sufficient conditions for the existence of Poisson stable trajectories will be formulated in this work.

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5.8 Semiconductors

Organizer : Herbert Gajewski

Key note lecture

Wigner Transforms,Homogenisation and Dispersive Problems

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It is well known by now that Wigner transforms are the appropriate tool to carry out the semiclassical limit of the Schroedinger equation. The weak limit of the Wigner transform of the wave function (the so called Wigner measure) then satisfies the Liouville phase space equation and limits of physical observables can be calculated by essentially computing moments of the Wigner measure. This limit procedure is not at all influenced by the possible occurance of caustics. In the talk we shall generalize the methodology of Wigner transforms to various applied p.d.e. problems. We consider zero pressure and compressible isentropic quantumhydrodynamics, the incompressible Euler limit from the nonlinear Schroedinger equation and mean field Schroedinger-Poisson coupling.

Also we show how the Wigner transform approach can be used to carry out homogenisation limits of quadratic functions (functionals) of solutions of linear and weakly nonlinear antiselfadjoint (pseudodifferential) initial value problems. As typical examples we discuss electrons in crystal lattices, the Maxwell equations in a periodic medium and