# GR 12 Grundlagen und allgemeiner Formalismus

Zeit: Montag 17:00–17:45 Raum: TU BH262

GR 12.1 Mo 17:00 TU BH262

**Riemannian light cone from vanishing birefringence in premetric vacuum electrodynamics** — •Claus Lämmerzahl[1] and Friedrich W. Hehl[2] — [1]ZARM, Univ. Bremen, Am Fallturm, 28359 Bremen — [2]Inst. Theor. Physics, Univ. of Cologne, Zülpicher Str. 77, 50923 Köln

We consider premetric electrodynamics with a local and linear constitutive law for the vacuum. Within this framework, we find quartic Fresnel wave surfaces for the propagation of light. If we require (i) the Fresnel equation to have only real solutions and (ii) the vanishing birefringence in vacuum, then a Riemannian light cone is implied. No proper Finslerian structure can occur. This consideration is generalized to dynamical equations of any order. One important consequence of that is that for vanishing birefringence an anisotropy of the velocity of light can only be experienced by comparing properties of the velocity of light with properties of solids which description is mainly based on the Dirac equation. (Published in Phys.Rev. D 70, 2004)

GR 12.2 Mo 17:15 TU BH262

**Die affine Gravitationstheorie im Multimomentum-Formalismus – Erhaltungsgrössen und lokaler Hamilton-Formalismus** — •Stephan Spenling — Institut für Theoretische Physik PN7-1, TU Berlin, Hardenbergstr. 36, 10623 Berlin, Germany

Zur Formulierung der Lagrange-Dichte der affinen Gravitationstheorie wird allein der Zusammenhang auf der Weltmannigfaltigkeit benötigt. Da in diesem Setting die Weltmannigfaltigkeit nicht foliierbar ist, wird diese Theorie im Multimomentum-Formalismus behandelt. Dabei werden die Zwangsbedingungen bestimmt, Erhaltungsgrössen hergeleitet und eine lokale Hamiltonfunktion konstruiert.

GR 12.3 Mo 17:30 TU BH262

**Relativity theory approach to rigorous justification of the Fermi acceleration mechanism and the law of entropy increase** — •Lev Pustyl'nikov — Universitat Bielefeld, Fakultat fur Physik, BiBoS, D-33501 Bielefeld,Germany

On the basis of taking account of relativistic effect the following physical problem are in essence solved:(i) the problem posed by Fermi of explaining the origin of high energy particles in the cosmic space, on the basis of the statistics of mechanical collisions of particles and macroobjects moving periodically in the cosmos, and (ii) the problem posed in the days of Clausius, Boltzmann, and Gibbs, of justifying the law of entropy increase in statistical physics. The rigorous investigation of these problems were carried out for relativistic versions of the Fermi-Ulam model ([1]), the Poincare model ([2]) and the generalized billiards ([4]).

[1]. L.D.Pustyl'nikov, "A new mechanism for particle acceleration and relativistic analogue of the Fermi-Ulam model", Teoret.Math.Phys.77(1),(1988). [2]. L.D.Pustyl'nikov, "Poincare model, rigorous justification of the second element of thermodynamics from mechanics, and the Fermi acceleration mechanism", Russ.Math. Surves 50 (1), (1995), 145-189. [3]. L.D.Pustyl'nikov, "On the mechanism for the origin of irreversibility, and the unbounded growth of energy in a model of statistical mechanics", Theoret. and Math. Phys.,86 (1991), 82-89. [4].M.V.Deryabin, L.D.Pustyl'nikov, "Exponential attractors in generalized relativistic billiards",Commun.Math.Phys.,248, N3,(2004), 527-552.