T 42: Astroteilchenphysik/Kosmologie (Theorie) 1

Convenor: M. Garny, B. Herrmann

Zeit: Dienstag 11:00–12:00 Raum: VSH 17

T 42.1 Di 11:00 VSH 17

Evolution of Chemical Potentials at Large Lepton Asymmetries — •Mandy M. Wygas and Dietrich Bödeker — Universität Bielefeld, Deutschland

An important phase in the early universe is the quark-hadron transition. It is well established that the order of the transition depends on the baryon density, or equivalently on the baryonchemical potential μ_B. In the QCD phase diagram in the $\mu_B - T$ plane, the cosmic QCD transition is commonly assumed to take place at vanishing baryonchemical potential $\mu_B \approx 0$. However, as the baryon chemical potential also depends on lepton flavour asymmetries, this is only valid for a total lepton asymmetry l of the order of the baryon asymmetry, $|l| \approx \mathcal{O}(b)$. While the magnitude of the baryon asymmetry, $b \simeq 10^{-10}$, can be determined by observations, l is only poorly constrained by observations and might be orders of magnitude larger than b, $|l| \lesssim 10^{-2}$. Thus potentially large lepton flavour asymmetries induce a large μ_B.

T 42.2 Di 11:15 VSH 17

Gauge Corrections to Leptogenesis I — Frederik Depta, •Andreas Halsch, and Owe Philipsen — Institut für Theoretische Physik, Goethe-Universität Frankfurt, Max-von-Laue-Str. 1, 60438 Frankfurt am Main, Germany

An attractive scenario for baryogenesis in the early universe is provided by leptogenesis through the decay of heavy Majorana neutrinos and subsquent conversion of lepton number to baryon number. We consider the quantum field theoretical calculation of the lepton asymmetry by solving Kadanoff-Baym equations as a systematic alternative to solving Boltzmann equations. In particular, we discuss the necessity for inclusion of gauge corrections and identify the relevant diagrams to be computed.

T 42.3 Di 11:30 VSH 17

Gauge Corrections to Leptogenesis II — •Frederik Depta, Andreas Halsch, and Owe Philipsen — Institut für Theoretische Physik, Goethe-Universität Frankfurt, Max-von-Laue-Str. 1, 60438 Frankfurt am Main, Germany

We discuss a systematic calculation of gauge corrections to leptogenesis, which requires resummations for a consistent and complete evaluation of the leading order contribution in the framework of Kadanoff-Baym equations. The resulting lepton number matrix includes all leading order Standard Model gauge corrections. It consists of a multidimensional integral over solutions of partial differential equations. We present prospects for its numerical solution.

T 42.4 Di 11:45 VSH 17

Nonequilibrium dynamics of inhomogenous quantum fields — •Thomas Garratt — Julius-Maximilians-Universitaet Wuerzburg

The dynamics of inhomogeneous quantum fields out of equilibrium are especially relevant for the study of first-order phase transitions. It is our aim to calculate how critical bubbles of the new phase, that form in such a process, propagate for different models. The Electroweak phase transition in the early universe is of particular interest, since Baryogenesis can potentially explain the matter-antimatter asymmetry in the Universe for fitting dynamical properties of the phase transition and the bubble collisions result in gravitational waves. To calculate the dynamics of quantum bubbles we have developed a computer program that solves the non-equilibrium equations of motion in the so called *2PI-Formalism*. As a starting point we have simulated the dynamics of bubbles in a scalar $\lambda_4\phi^4 + \lambda_6\phi^6$ toy model in (1+1)-dimensions.