MP 2: Quantenfeldtheorie im gekrümmten Raum

Zeit: Dienstag 14:00–16:00 Raum: VMP6 HS B

Hauptvortrag MP 2.1 Di 14:00 VMP6 HS B

Spin, Statistics and SPASs — •Christopher Fewster — Department of Mathematics, University of York, York, U.K.

Many of the main problems in quantum field theory in curved spacetime (QFT in CST) stem from the fact that there is, in general, no (nontrivial) replacement for the Poincaré symmetry group. Because Poincaré symmetry is at the root of many of the main structural features of QFT in Minkowski space, such as the spin-statistics connection, axiomatic approaches to QFT in CST have been under-developed until fairly recently.

In this talk, I describe some recent progress in the locally covariant framework for QFT in curved spacetimes, taking the spin-statistics connection as the main example. I will also discuss how the framework allows one to pose and partly resolve the issue of whether a given theory can be said to describe the Same Physics in All Spacetimes (SPASs).

Hauptvortrag MP 2.2 Di 14:45 VMP6 HS B

Unruh effect and Tolman temperature — •Rainer Verch[1] and Detlev Buchholz[2] — [1]Institut für Theoretische Physik, Universität Leipzig — [2]Institut für Theoretische Physik, Universität Göttingen

The Unruh effect is often portrayed as due to a thermal gas of noninertial quantum particles in which an accelerated detector is immersed. Following this heat-bath like interpretation of the Unruh effect, the Unruh temperature of an accelerated detector is often identified with the Tolman temperature of an ideal relativistic gas in a homogeneous, static gravitational field. We show that this interpretation is in conflict with the homogeneity of the quantum field vacuum on Minkowski spacetime, and that there is a modified relation between the Unruh effect temperature and a local (Tolman-like) temperature for a quantum field. As will be pointed out, the discrepancy is due to the fact that the coupling between Unruh detector and quantum field is not only exchanging heat but also energy and particles owing to inevitable quantum fluctuations which arise from the localized coupling between detector and quantum field.

10 Minuten Pause

MP 2.3 Di 15:40 VMP6 HS B

The Lieb-Liniger model at the critical point as toy model for Black Holes — •Mischa Panchenko — Ludwig Maximilian Universität, München

In a previous series of papers it was proposed that black holes can be understood as Bose-Einstein condensates at the critical point of a quantum phase transition. Therefore other bosonic systems with quantum criticalities, such as the Lieb-Liniger model with attractive interactions, could possibly be used as toy models for black holes. Even such simple models are hard to analyse, as mean field theory usually breaks down at the critical point. Very few analytic results are known. In this paper we present a method of studying such systems at quantum critical points analytically. We will be able to find explicit expressions for the low energy spectrum of the Lieb-Liniger model and thereby to confirm the expected black hole like properties of such systems. This opens up an exciting possibility of constructing and studying black hole like systems in the laboratory.