Sonderforschungsbereich 631

Festkörperbasierte Quanteninformationsverarbeitung

Seminar Announcement

Fakultät für Physik der Universität Regensburg

Universitätsstr. 31, 93053 Regensburg

Sprecher: Dr. Eugene Sukhorukov
Département de Physique Théorique
Université de Genève

Ort: Seminarraum, PHY 9.2.01

Zeit: Donnerstag 14. Januar 2010, 13.30 Uhr

Thema: Anomalous dephasing in electronic Mach-Zehnder interferometers

Abstract:

Recently, Aharonov-Bohm (AB) effect in electronic Mach-Zehnder (MZ) interferometers has attracted much attention among experimental and theoretical physicists. These interferometers, for the first time experimentally realized in the group of Heiblum, utilize quantum Hall edge states in place of optical beams, and quantum point contacts (QPC) as beam splitters, to partition edge channels. Theoretical attempts to explain experimentally observed puzzling lobe-type behavior of the visibility of AB oscillations as a function of voltage bias have focused on the filling factor nu=1 state. To date, however, all the experiments, reporting multiple side lobes in the visibility function of voltage bias, have been done at filling factor nu =2. We will argue that, in fact, there are two main mechanisms of dephasing in MZ interferometers. One mechanism, due to spontaneous emission of edge magneto-plasmons, leads to a size effect, which explains the lobes and many other details of experiments. According to the second mechanism, dephasing in electronic MZ interferometers is due to an external noise source. Experimentally, such a noise is created with the help of an additional QPC with the transparency T that partitions incident edge channels. We predict that a phase transition occurs at T=1/2, where the visibility function of voltage bias sharply changes its behavior. An important role in this phenomenon is played by a non-Gaussianity of noise, which is typically negligible because of a weak coupling. It turns out that MZ interferometers are strongly coupled to noise. They, therefore, can be considered efficient detectors of full counting statistics.

Hausadresse:
Universitätsstraße 31
93053 Regensburg

Postadresse:
Universität
93040 Regensburg

Telefon: (0941) 943-3199
Telefax: (0941) 943-3196

e-mail:
Christoph.Strunk@
physik.uni-regensburg.de