

Physikalisches Kolloquium

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Spintronics: from magnetic memories to black holes

Over the past two decades spintronics has been concerned with utilizing the electron spin rather than its charge. Most of the envisioned applications, predominantly in the context of magnetic memories, make use of the interaction between spin-polarized currents and magnetization dynamics in ferromagnets. A great deal of research has been devoted to understanding, characterizing and controlling these interactions. In this talk I will review these developments. I will in particular discuss the example of magnetic domain walls, and how their motion can be controlled by spin currents. An envisioned application is the so-called magnetic race-track memory that I will discuss briefly. Building further on this understanding, I will also describe how the interaction between spin currents and magnetization dynamics can be used to implement black-hole horizons for spin waves. The latter are wave-like oscillations in the magnetization direction, also referred to as magnons. Finally, I will discuss how these black-hole-like horizons can be used to amplify spin waves and make a magnon laser. The latter idea may be important in the field of magnonics, that seeks to replace the electron with spin waves/magnons in data-processing applications.

Montag, 16.07.2018, 16:15 Uhr

Ort: Hörsaal 6