

CONDENSED MATTER THEORY SEMINAR

Subject: **The chiral anomaly in real space**

Speaker: **Prof. Björn Trauzettel (Universität Würzburg)**

Date & time: **Friday, December 9th, 2016 at 3:15 p.m.**

Venue: **Seminar room 1.114**

Abstract: The chiral anomaly is based on a non-conserved chiral charge and can happen in Dirac fermion systems under the influence of external electromagnetic fields. In this case, the spectral flow leads to a transfer of right- to left-moving excitations or vice versa. The corresponding transfer of chiral particles happens in momentum space. We here describe an intriguing way to introduce the chiral anomaly into real space. Our system consists of two quantum dots that are formed at the helical edges of a quantum spin Hall insulator by means of magnetic barriers. Such a setup gives rise to fractional charges which we show to be sharp quantum numbers for large barrier strength. Interestingly, it is possible to map the system onto a quantum spin Hall ring in the presence of a flux pierced through the ring where the relative angle between the magnetization directions of the barriers takes the role of the flux. The chiral anomaly in this system is then directly related to the excess occupation of particles in the two quantum dots. This analogy allows us to predict an observable consequence of the chiral anomaly in real space.