



## Seminar: Hard Condensed Matter Theory

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**Room: Galilei room, 01-128 (Staudinger Weg 9)**  
**Time: Tuesday, 23.06.2015, 14:15**

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## Magnetic monopoles in quantum spin ice

Conventional spin ice is a well-established class of classical spin liquids, which is best known for having emergent magnetic monopoles as its excitations. Quantum spin liquids, one of the central topics in today's condensed matter research, are exotic phases of matter, which are particularly challenging to identify experimentally due to their lack of conventional magnetic order. One of the promising routes to find materials realizations for quantum spin liquids is to study a quantum generalization of spin ice. This explains the high interest in studies of quantum spin ice by both theorists and experimentalists in the recent years. However, precisely what signatures to look for to nail down quantum behavior in spin ices is not clear. In this talk I will show that the most visible place to look for quantum effects in spin ice is in the presence of emergent magnetic monopoles, whose fractionalized nature is perhaps the most striking feature of this system. Our focus is on the case of weakly diluted quantum spin ice, where we find the emergence of hydrogenic excited states, resembling those in doped semiconductors, in which a magnetic monopole is bound to the vacancy at various distances. We obtain an approximate expression for the neutron scattering dynamic structure factor [1] via a mapping to an effective exactly solvable model defined on the Bethe lattice.

References: [1] O. Petrova, R. Moessner, S. L. Sondhi, arXiv:1501.02445

**All interested are cordially welcome!**