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Fermions and bosons : excitons in strongly correlated materials

Rademaker, L.

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Author: Rademaker, Louk

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Curriculum Vitae

I WAS BORN on 26 November 1986 in Vleuten, the Netherlands. Upon completion of my secondary education in 2002 at the Dalton-Vatel in Voorburg, I started studying mathematics and astronomy at Leiden University. I obtained my BSc degree in both fields in 2006, with a thesis under the supervision of Vincent Icke and Vivi Rottschäfer on shock waves in planetary nebulae.

Subsequently, I started to do theoretical physics, for which I obtained a cum laude Masters degree in September 2008. The corresponding thesis under supervision of Koenraad Schalm was entitled "Phase Transitions in Matrix Models". Soon thereafter I decided to switch to theoretical condensed matter physics, and in January 2009 I started to work part-time on my PhD research with Jan Zaanen, Jeroen van den Brink and Hans Hilgenkamp. I was based at the Lorentz Institute, Leiden University, though I had the privilege of visiting Twente University; Stanford University, CA; IFW-Dresden, Germany and the National High Magnetic Field Laboratory in Tallahassee, FL. My teaching duties consisted of assisting the courses Theory of Condensed Matter (2009), Quantum Field Theory (2010-2013) and Effective Field Theory (2011-2013). As a member of the PhD Council of the Dutch Research School for Theoretical Physics I was one of the organisers of the annual PhD-Day (2011-2013) and the Trends in Theory 2013 conference. Additionally I was member of the Instituutsraad of the Leiden Institute of Physics (LION).

Next to my scientific work I have been active in politics. Since 2006 I have been an elected member of the city council of Leiden, as a representative for the Socialist Party.

Publications

- Louk Rademaker, Jan Zaanen and Hans Hilgenkamp, *Prediction of quantization of magnetic flux in double-layer exciton superfluids*, Phys. Rev. B **83**, 012504 (2011); arXiv:1009.1793. See section 2.2.
- Louk Rademaker, Kai Wu, Hans Hilgenkamp and Jan Zaanen, *The dynamical frustration of interlayer excitons delocalizing in bilayer quantum antiferromagnets*. Europhys. Lett. **97**, 27004 (2012); arXiv:1106.5347. See section 4.2.
- Louk Rademaker, Kai Wu and Jan Zaanen, *Dynamics of a single exciton in strongly correlated bilayers*, New J. Phys. **14**, 3040 (2012); arXiv:1202.3616. See section 4.2.
- Louk Rademaker, Jeroen van den Brink, Hans Hilgenkamp and Jan Zaanen, *Enhancement of spin propagation due to interlayer exciton condensation*, Phys. Rev. B **88**, 121101(R) (2013); arXiv:1304.3643. See section 5.1.
- Louk Rademaker, Yohanes Pramudya, Jan Zaanen and Vladimir Dobrosavljević, *Influence of long-range interactions on charge ordering phenomena on a square lattice*, Phys. Rev. E **88**, 032121 (2013); arXiv:1306.4765. See chapter 6.
- Louk Rademaker, Jeroen van den Brink, Jan Zaanen and Hans Hilgenkamp, *Exciton condensation in strongly correlated electron bilayers*, arXiv:1310.0685. See section 5.2.
- Louk Rademaker, Steve Johnston, Jan Zaanen and Jeroen van den Brink, *Determinant quantum Monte Carlo study of exciton condensation in the bilayer Hubbard model*, arXiv:1310.0623. See section 3.3.

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My friends in Twente, in particular Marcel Hoek and Francesco Coneri, always reminded me of the primacy of experiments over theory. I thank Jeroen Huijben for the beautiful pictures he made. Additionally I had the opportunity to make several foreign visits: to the group of Tom Devereaux at Stanford University where I thank especially Brian Moritz and Steve Johnston for teaching me Monte Carlo techniques, to the IFW-Dresden and finally, to the National High Magnetic Field Lab in Tallahassee, Florida, where I wish to thank Yohanes Pramudya, Vladimir Dobrosavljević and in particular Samiyeh Mahmoudian.

The acknowledgements section is just too short to name everybody, instead, let me hereby thank all other people that I have had inspiring physics discussions with.

From a scientific point of view this might be contested, but life is more than physics. I want to thank all my friends, though they did not contribute directly to the content of this thesis, they did contribute in keeping me sane and happy. The same holds true for my family, especially my brother Merijn, my father Jan and mother Ruth.