



Universiteit
Leiden
The Netherlands

The lead zeppelin : a force sensor without a handle

Waarde, B. van

Citation

Waarde, B. van. (2016, November 2). *The lead zeppelin : a force sensor without a handle*. *Casimir PhD Series*. Retrieved from <https://hdl.handle.net/1887/43816>

Version: Not Applicable (or Unknown)

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/43816>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/43816> holds various files of this Leiden University dissertation

Author: Waarde, Bob van

Title: The lead zeppelin : a force sensor without a handle

Issue Date: 2016-11-02

List of Publications

L. Rademaker, T. van der Reep, N. Van den Broeck, B. van Waarde, M. de Voogd and T. Oosterkamp, “The Instability of a Quantum Superposition of Time Dilations”, *submitted*, preprint available at *arXiv:1410.2303*.

B. van Waarde, O. Benningshof and T. Oosterkamp, “A Magnetic Persistent Current Switch at milliKelvin Temperatures”, *Cryogenics*, vol. 78, p. 74, 2016.

B. van Waarde, M. de Wit, G. Koning and T. Oosterkamp, “Flying a Lead Zeppelin, a Force Sensor without a Handle”, *in preparation*.

Curriculum Vitae

The author was born on November 16th, 1986, in Haarlem, the Netherlands. He went to Lyceum Sancta Maria in Haarlem for his gymnasium high school diploma, and graduated in 2005.

Following this, he started a Bachelor of Science in Applied Physics at Delft University of Technology. The Bachelor of Science degree was obtained in 2010, for which the author studied the mechanical properties of suspended graphene in the group of prof. dr. ir. H. S. J. van der Zant.

As there was no ‘hard cut’ (*harde knip*) between the Bachelor and Master programmes at the time, he could start with his Master of Science in 2009. During the master’s, he made a switch of universities, and a Master of Science degree in Theoretical Physics was obtained in 2011 at Leiden University, for which he studied string theory and the quantum mechanics of charged fermions in fancy curved spacetimes under supervision of prof. dr. K. E. Schalm.

In 2012, he started his PhD in Experimental Physics at Leiden University in the group of prof. dr. ir. T. H. Oosterkamp, where he manufactured and studied the magnetic levitation of a small superconducting particle — the Lead Zeppelin.

Acknowledgements

During the past four years of my PhD I have received the help and support from many people. Words can never adequately express my gratitude, nor can I thank everyone who bore with me all this time within the restraints of this short acknowledgement. Nevertheless, I want to devote some words of appreciation on at least some of these people here.

First, I want to thank my supervisor Tjerk for giving me the opportunity to do a PhD, and for his immense help and vast involvement in the many aspects of my experiments and this thesis. I feel lucky to have had you for my supervisor. I thank my colleagues Marc, Jelmer, Arthur, Martin, Tom, Lucia, Gesa and Olaf, in various subsets, for valuable discussions, the awesome road trip in the USA, help with setting up experiments and understanding data, proofreading this thesis, Whisky Friday, and overall their good companionship.

I thank Ellie, who took care of effectively all bureaucracy, and without whom the scientific output from our institute would certainly quickly grind to a halt. Also thanks for the coffee.

I thank the Department of Fine Mechanics for their creative solutions to my questions and their amazing craftsmanship; in particular Gert Koning, Fred Schenkel and Christiaan Pen. Likewise, the Electronics Department deserves my gratitude for help with electronics and computer related problems. I further thank Hans van Kuyk and Wilfred van der Geest, who have supplied me with much-needed liquid Helium throughout the course of my PhD.

I thank Marcel Rost, Wim Bosch and Kier Heeck for sharing their knowledge with me, and for their indispensable suggestions for improvements on the experimental design.

I want to thank my family, to whom I must have appeared to have completely faded from existence from time to time (sorry about that).

Finally, this PhD would have been impossible if not for my physics buddies and close friends Bart, Ruud, Robert-Jan, Chris, Daniël, Fran(çoi)s, Victor and Bas, who helped me greatly during the course of my PhD, professionally as well as personally.