

Announcement of Seminar  
Quantum Science on Strong Correlation Theory Forum

Place: 3F meeting room (#309), Frontier Research Laboratory

Time: 10:00~ Feb. 9 (Thursday), 2012

**Observing holographic superconductivity in the laboratory**

J. Zaanen

Institute Lorentz for Theoretical Physics, Leiden University, Leiden,  
The Netherlands

The promise of the present flirtation between string theory and condensed matter physics is that the former will finally demonstrate empirical relevance by shedding light on the great mysteries of the latter. The holy grail problem in condensed matter has been since 25 years the mechanism of superconductivity at a high temperature. On the other hand, the first substantial result produced by the AdS/CFT correspondence in this context is the discovery of holographic superconductivity by Gubser and Hartnoll-Herzog-Horowitz in 2008. This demonstrates that the superradiance instability of an AdS Reissner-Nordstrom black hole in the presence of a scalar field dualizes in the statement that a strongly interacting conformal field theory at a finite density has a superconducting instability that bears similarities to the standard BCS mechanism while it is yet very different. I will present and explain the design of an experiment that is practical enough to be realized in the experimental laboratory, being tailored to observe the qualitative differences between the BCS and the holographic mechanisms [1].

[1] J.-H. She *et al.*, Phys. Rev. B **84**, 144257 (2011); D. van der Marel and J.N. Hancock, Physics **4**, 89.