UNIVERSITÄT DUISBURG ESSEN

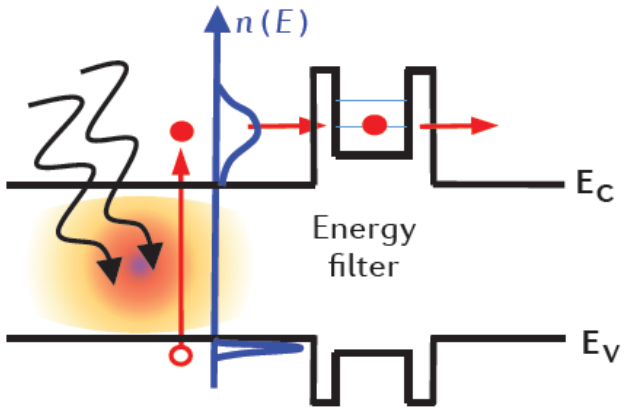
PHYSIK E=

Physikalisches Kolloquium

Mittwoch, 06.06.2018
13:00 Uhr
Hörsaal MC 122

Ideal thermoelectrics for ideal solar cells

Prof. Dr. Heiner Linke
Director of NanoLund, Lund University, Schweden



One of the key losses in conventional solar cells is due to the thermalization of photogenerated carriers, resulting in waste heat. Hot-carrier solar cells seek to harvest this extra energy resource by extracting carriers before they cool to the ambient temperature. Here we point out that the problem of harvesting this energy is essentially that of thermal-to-electric energy conversion. We recently demonstrated, in devices based on single nanowires, that thermoelectric energy conversion can be performed near the ideal, thermodynamic limits [1,2]. Marrying the two approaches in nanowires [3,4] offers an exciting new direction towards efficient solar-to-electric energy conversion.

[1] Humphrey, T. E., Newbury, R., Taylor, R. P., & Linke, H. (2002). Reversible Quantum Brownian Heat Engines for Electrons. Physical Review Letters, 89(11), 116801. http://doi.org/10.1103/PhysRevLett.89.116801

[2] Martin Josefsson, Artis Svilans, Adam M. Burke, Eric A. Hoffmann, Sofia Fahlvik, Claes Thelander, Martin Leijnse, Heine Linke: A quantum-dot heat engine operated close to thermodynamic efficiency limits. arXiv:1710.00742 (submitted)

[3] Limpert, S., Bremner, S., & Linke, H. (2015). Reversible electron–hole separation in a hot carrier solar cell. New Journal of Physics, 17(9), 1–11

[4] Limpert, S., Burke, A., Chen, I.-J., Anttu, N., Lehmann, S., Fahlvik, S., et al. (2017). Single-nanowire, low-bandgap hot carrier solar cells with tunable open-circuit voltage. Nanotechnology, 28(43), 434001