“Nanoscale heat radiation”

The properties of thermal radiation close to the surface of a material alter drastically from the well-known textbook results for black body radiation. It could be shown that the thermal near-field can be quasi-monochromatic and exhibit a relatively large spatial correlation time and length [1,2]. Furthermore, heat radiation can exceed the black body result by several orders of magnitude which is an astonishing effect which has been tested in the last ten years by a number of experimental setups as for example the one in Ref. [3].

I intend to give first a brief introduction into the theoretical treatment of nanoscale thermal radiation, to discuss the different heat flux channels at the nanoscale and the measurement by some of the recent experimental setups including the measurements with a near-field scanning thermal microscope [4] which has been developed at the University of Oldenburg. After this introductory part I will present some of the current theoretical developments in the field of thermotronics, i.e. concepts for the control of nanoscale thermal radiation by means of devices like diodes and transistors [5,6]. Finally, if we have the time I will comment on theoretical predictions on circular heat flux in magneto-optical systems which are at the heart of the thermal Hall effect [7] and the persistent current [8].