Introduction to the Special Issue on “Terahertz Near-field Optics”

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Terahertz science and technology are progressing at a tremendous speed as evidenced by the ever increasing numbers of publications in this field. The field is becoming large enough that we can begin to sub-divide it into various specializations. One of these is “Terahertz near-field microscopy”. Pure and simple, it is the science and technology of beating the terahertz diffraction limit, in other words, imaging with a spatial resolution better than about half-of-a wavelength. In this issue we have four invited contributions giving a flavor of what this subfield is currently about. The first paper, “Review of Near-Field Terahertz Measurement Methods and Their Applications; How to Achieve Sub-wavelength Resolution at THz Frequencies” by A. J. L. Adam from the University of Technology Delft, the Netherlands, provides an extensive overview of state-of-the-art terahertz near-field microscopy techniques. M. Walther, from the University of Freiburg, Germany, and A. Bitzer, currently at the University of Bern, Switzerland, wrote a paper entitled “Electromagnetic Wave Propagation Close to Microstructures Studied by Time and Phase-Resolved THz Near-field Imaging”, in which they show results of measurements of the terahertz electromagnetic field near metal structures, such as sub-wavelength sized holes and wires. R. Mueckstein and co-workers, from University College London, UK, and Rutgers University USA, in their paper “Imaging and analysis of THz surface plasmon polariton waves with the integrated subwavelength aperture probe” discuss the intricacies of measuring terahertz surface plasmon polaritons using a near-field probe, showing results of measurements of surface waves near small apertures and bow-tie antennas. Finally, A. Doi and co-workers, from Olympus Corporation, CREST, and Kyoto University, Japan, in “Improving Spatial Resolution of Real-Time Terahertz Near-Field Microscope” discuss the limitations of their recently developed real-time terahertz near-field imaging setup.

All papers show the fantastic progress that has been made in the past few years in THz near-field microscopy. Many groups at various places in the world are working in this area and it is thus to be expected that in the coming years more spectacular results will emerge. Until then I hope you’ll enjoy reading the papers in this special issue!

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