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Seminar

Theory of second harmonic generation on excitons in ZnO

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Location: **Lecture hall A1, Paderborn**

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Abstract

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Nonlinear optics of semiconductors is an important field of fundamental and applied research, but surprisingly the role of excitons in the coherent processes leading to harmonics generation has remained essentially unexplored. A microscopic theory of second harmonic Generation (SHG) on excitons in ZnO is developed, which shows that the nonlinear interaction of coherent light with excitons has to be considered beyond the electric-dipole approximation. Depending on the particular symmetry of the exciton states SHG can originate from the electric- and magnetic-field-induced perturbations of the excitons due to the Stark effect, the spin as well as orbital Zeeman effects, or the magneto-Stark effect. The importance of each mechanism is analyzed and discussed by confronting experimental data and theoretical results for the dependences of the SHG signals on photon energy, magnetic field, electric field, crystal temperature, and light polarization. Good agreement is obtained between experiment and theory proving the validity of our approach to the complex problem of nonlinear interaction of light with ZnO excitons.
This general approach can be applied also to other semiconductors.