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Basic requirements of spin-flip Raman scattering on excitonic resonances and its modulation through additional high-energy illumination in semiconductor heterostructures

© J. Debus¹, D. Kudlacik¹, V.F. Sapega², T.S. Shamirzaev^{3,4}, D.R. Yakovlev^{1,2}, D. Reuter⁵, A.D. Wieck⁶, A. Waag⁷, M. Bayer^{1,2}

¹ Experimentelle Physik 2, Technische Universität Dortmund, Dortmund, Germany

² Ioffe Institute, Russian Academy of Sciences, St. Petersburg, Russia

³ Institute of Semiconductor Physics, Russian Academy of Sciences, Novosibirsk, Russia

⁴ Ural Federal University, Yekaterinburg, Russia

⁵ Department Physik, Universität Paderborn, Paderborn, Germany

⁶ Angewandte Festkörperphysik, Ruhr-Universität Bochum, Bochum, Germany

⁷ Institute of Semiconductor Technology, University of Braunschweig, Braunschweig, Germany

E-mail: joerg.debus@tu-dortmund.de

We describe the major requirements to experimentally perform and observe resonant spin-flip Raman scattering on excitonic resonances in low-dimensional semiconductors. We characterize in detail the properties of this resonant light scattering technique and evaluate the criteria, which must be fulfilled by the experimental setup and the semiconductor sample studied to be able to observe a spin-flip scattering process. We also demonstrate the influence of additional unpolarized laser illumination with energies, which exceed considerably the band gap energy of the semiconductor nanostructure under study, on the resonantly excited electron spin-flip scattering in InAs-based quantum dot ensembles as well as on the paramagnetic Mn-ion spin-flip in (Zn,Mn)Se/(Zn,Be)Se quantum wells.

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