Magnetic interlayer coupling across parabolic quantum well

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The physics of quasi-2D electron gas /2DEG/ has been influencial in condensed matter magnetism research since the discovery of the oscillatory interlayer coupling in magnetic superlattices. In case of rectanglar profiles of the quantum-wells /QW/ formed by the superlattice potential the theory of interlayer coupling was elaborated over ten years ago. However, there is only limited progress in description of magnetic interactions in the nonsquare-QW superlattices [1], [2]. In our contribution we will present theory of interlayer coupling in the case of parabolic QW system. Contrary to the conventional models based on perturbative or total energy approaches we exploit the similarities of the quasi-2DEG oscillations within parabolic QW to the de Haas-van Alphen effect [3]. We derive formula for the interlayer coupling parameters as the function of potential barrier heights and the nonmagnetic layer thickness. Applications of the results obtained to the description of real systems will be widely discussed.

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[2] Z. Bak Solid State Commun. **118**, 43 (2001).
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9.7 cm

13.4 cm

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