

Anomalous thickness dependence of the Hall effect in ultrathin Pb layers on Si(111)

I. Vilfan^{1,2}, M. Henzler¹, O. Pfennigstorf¹, H. Pfnür¹

¹*Institut für Festkörperphysik, Universität Hannover, Appelstrasse 2, D-30167 Hannover, Germany*

²*J. Stefan Institute, Jamova 39, SI-1001 Ljubljana, Slovenia*
pfnuer@fkp.uni-hannover.de

The magnetoconductive properties of ultrathin Pb films deposited on Si(111) are measured and compared with density-functional electronic band-structure calculations on two-dimensional, free-standing, 1 to 8 monolayers thick Pb(111) slabs. A description with free-standing slabs is possible because it turned out that the Hall coefficient is independent of the substrate and of the crystalline order in the film [1,2]. We show that the oscillations in sign of the Hall coefficient observed as a function of film thickness can be explained directly from the thickness dependent variations of the electronic bandstructure at the Fermi energy.

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[2] M. Jałochowski, M. Hoffmann and E. Bauer, Phys. Rev. Lett. **76**, 4227 (1996).