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Author(s)	Moriya, Rai; Sawano, Kentarou; Hoshi, Yusuke et al.
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Supplemental Material for
“Cubic Rashba spin–orbit interaction of two-dimensional hole gas in strained-Ge/SiGe quantum well”

Rai Moriya¹, Kentarou Sawano², Yusuke Hoshi^{1,2}, Satoru Masubuchi^{1,3}, Yasuhiro Shiraki², Andreas Wild^{4,5}, Christian Neumann⁵, Gerhard Abstreiter^{4,6}, Dominique Bougeard⁵, Takaaki Koga⁷, and Tomoki Machida^{1,3}

¹ *Institute of Industrial Science, University of Tokyo, 4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan*

² *Advanced Research Laboratories, Tokyo City University, 8-15-1 Todoroki, Setagaya-ku, Tokyo 158-0082, Japan*

³ *Institute for Nano Quantum Information Electronics, University of Tokyo, 4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan*

⁴ *Walter Schottky Institut and Physics Department, Technische Universität München, Am Coulombwall 4, 85748 Garching, Germany*

⁵ *Institut für Experimentelle und Angewandte Physik, Universität Regensburg, Universitätsstraße 31, 93040 Regensburg, Germany*

⁶ *Institute for Advanced Study, Technische Universität München, Lichtenbergstraße 2a, 85748 Garching, Germany*

⁷ *Division of Electronics for Informatics, Graduate School of Information Science and Technology, Hokkaido University, Hokkaido 060-0814, Japan*

The WL and WAL data has been analyzed using the Iordanskii, Lyanda-Geller, and Pikus (ILP) theory for magnetoconductivity, which incorporates both k -linear $\mathbf{\Omega}_1$ and k -cubic $\mathbf{\Omega}_3$ effective magnetic fields in frequency units and it is expressed as following [1,2,3]:

$$\Delta\sigma(B) = -\frac{e^2}{4\pi^2\hbar} \left[\frac{1}{a_0} + \frac{2a_0 + 1 + \frac{B_{\text{SO1}} + B_{\text{SO3}}}{B}}{a_1 \left(a_0 + \frac{B_{\text{SO1}} + B_{\text{SO3}}}{B} \right) - 2\frac{B_{\text{SO1}}}{B}} \right. \\ \left. - \sum_{n=0}^{\infty} \left\{ \frac{3}{n} - \frac{3a_n^2 + 2a_n \frac{B_{\text{SO1}} + B_{\text{SO3}}}{B} - 1 - 2(2n+1)\frac{B_{\text{SO1}}}{B}}{\left(a_n + \frac{B_{\text{SO1}} + B_{\text{SO3}}}{B} \right) a_{n-1} a_{n+1} - 2\frac{B_{\text{SO1}}}{B} [(2n+1)a_n - 1]} \right\} \right. \\ \left. + 2\ln \frac{B_{\text{tr}}}{B} + \Psi \left(\frac{1}{2} + \frac{B_{\phi}}{B} \right) + 3C \right], \quad (\text{S1})$$

where

$$a_n = n + \frac{1}{2} + \frac{B_{\phi}}{B} + \frac{B_{\text{SO1}} + B_{\text{SO3}}}{B}, \quad B_{\phi} = \frac{\hbar}{4eD\tau_{\phi}}, \\ B_{\text{SO1}} = \frac{\hbar}{4eD} 2|\mathbf{\Omega}_1|^2 \tau_{\text{tr}}, \quad B_{\text{SO3}} = \frac{\hbar}{4eD} 2|\mathbf{\Omega}_3|^2 \tau_{\text{tr}}, \quad (\text{S2})$$

Ψ is the digamma-function, C is Euler constant, e is the electron charge, $\hbar$ is Planck's constant, D is the diffusion constant, τ_{ϕ} is the phase coherent time of the carrier, and τ_{tr} is the elastic scattering time.

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