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**Separation of the Rashba and Dresselhaus terms using the Square and Rectangular Loop Arrays in InGaAs/InAlAs Quantum Wells**  
TAKAAKI KOGA<sup>1</sup>, MINU KIM, Faculty of Eng., GSIST and CRIS (SOUSEI), Hokkaido University, Sapporo, Japan; <sup>1</sup>CREST, JST, YOSHIAKI SEKINE, NTT BRL, NTT Corporation, Atsugi, 243-0198, Japan — The spin interference effect [1,2] was investigated for square and rectangular loop arrays that were nanolithographically defined in InGaAs/InAlAs quantum wells both theoretically and experimentally. In theory, interference between the following spin wave functions were considered :  $\Psi^{CW} = \mathbf{R}_{-x}(\theta_v)\mathbf{R}_y(\theta_h)\mathbf{R}_x(\theta_v)\mathbf{R}_{-y}(\theta_h)\Psi_i$  (wave function after the clockwise path in a rectangular loop) and  $\Psi^{CCW} = \mathbf{R}_y(\theta_h)\mathbf{R}_{-x}(\theta_v)\mathbf{R}_{-y}(\theta_h)\mathbf{R}_x(\theta_v)\Psi_i$  (wave function after the counter-clockwise path), where the spin rotation operators  $\mathbf{R}_\xi(\theta_{v,h})$  were obtained from solving the Poisson and Schrödinger equations self-consistently including the Rashba and Dresselhaus Hamiltonians. Then, the gate-dependence of the norm  $|\Psi^{CW} + \Psi^{CCW}|^2$ , averaged over all directions for the initial spin ( $\Psi_i$ ), were compared to the gate-dependence of the AAS oscillation amplitude in the experiment. We propose that the measurement of the spin interference effect is a reliable method for the simultaneous determination of the Rashba and Dresselhaus terms quantitatively. [1] Koga *et al.*, PRB **70**, 161302(R) (2004); *ibid.* **74**, 041302(R) (2006). [2] Koga *et al.*, phys. stat. sol. (C) **3**, 4220 (2006).

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