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Electrical Control of Magnetoresistance In a InP-Based Lateral Spin Valve with a Two-Dimensional Electron Gas (2-DEG) Channel HYUN KUM, DEBASHISH BASU, PALLAB BHATTACHARYA, WEI GUO, Univeristy of Michigan-Ann Arbor — Electrical field control of spin transport has been of recent interest. The control of magnetoresistance of a lateral InP-based spin valve consisting of a InAs/$In_{0.53}Ga_{0.47}As$/$In_{0.52}Al_{0.48}As$ 2-DEG channel with a gate electrode is demonstrated. The polarizer and analyzer are made with MnAs/$In_{0.52}Al_{0.48}As$ Schottky tunnel barriers and the Ti/Au gate electrode is placed outside the channel region, of length 0.6 μm, and alongside the polarizer. The magnetoresistance changes from 0.14 to 4% at 10 K, when the gate bias is changed from 0 to 8V, in a device in which the magnetization of the polarizer and analyzer is in the direction of spin transport in the 2-DEG. The effect is absent in a GaAs channel spin valve and other control devices, indicating that the observed change in magnetoresistance in the 2-DEG spin valve is due to Rashba spin-orbit coupling. The results will be compared with those obtained from spin valves in which the gate is placed directly above the local spin valve channel region.

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