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3T and nonlocal 4T Hanle measurements of spin accumulation in the persistent photoconductor $Al_{0.3}Ga_{0.7}As$:Si[1] JOON-IL KIM, K. KOUNTOURIOTIS, T. LIU, S. VON MOLNAR, P. XIONG, Florida State University, J. LU, X.Z. YU, J.H. ZHAO, Institute of Semiconductors, Chinese Academy of Sciences — 3-terminal (3T) and nonlocal 4-terminal (4T) Hanle measurements have been performed on a spin injection/detection device with patterned Fe electrodes and $Al_{0.3}Ga_{0.7}As$:Si, a persistent photoconductor, as the channel. The persistent photoconductivity facilitates *in situ* incremental photo-doping of the AlGaAs channel, which enables direct comparisons of the 3T and 4T Hanle results on the same device over a broad range of carrier densities across the insulator-metal transition. Although their magnitudes differ by about an order of magnitude, the 3T and 4T Hanle signals exhibit broad similarities in their dependencies on the injection current and carrier density, as well as the resulting spin lifetimes. Specifically, at each bias current, the magnitudes of both the 3T and 4T Hanle signals are observed to decrease exponentially with increasing carrier density of the AlGaAs deep into the metallic state. The spin lifetimes extracted from the 3T and 4T Hanle curves, both via the FWHM of the Lorentzian fit and the 1D spin drift-diffusion model analysis, show similar values and evolution with the carrier density.

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