Abstract Submitted for the FWS17 Meeting of The American Physical Society

Strong electron-hole symmetric Rashba spin-orbit coupling in graphene/monolayer transition metal dichalcogenide heterostructures¹ MARK LOHMANN, BOWEN YANG, DAVID BARROSO, INGRID LIAO, ZHISHENG LIN, YAWEN LIU, LUDWIG BARTELS, KENJI WATANABE, TAKASHI TANIGUCHI, JING SHI, None — Despite its extremely weak intrinsic spin-orbit coupling (SOC), graphene has been shown to acquire considerable SOC by proximity coupling with exfoliated transition metal dichalcogenides (TMDs). I will present our results of strong induced Rashba SOC in graphene that is proximity coupled to a monolayer of MoS_2 and WSe_2 grown by chemical-vapor deposition with drastically different Fermi level positions. We observed strong induced graphene SOC that manifests itself in a pronounced weak-antilocalization (WAL) effect in the graphene magnetoconductance. The spin-relaxation rate extracted from the WAL analysis varies linearly with the momentum scattering time and is independent of the carrier type. This indicates a dominantly Dyakonov-Perel spin-relaxation mechanism caused by the induced Rashba SOC. Our analysis yields a Rashba SOC energy of ~ 1.5 meV in graphene/WSe₂ and ~ 0.9 meV in graphene/MoS₂. The nearly electron-hole symmetric nature of the induced Rashba SOC provides a clue to possible underlying SOC mechanisms.

¹This work was supported by the DOE BES award No.DE-FG02-07ER46351

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Date submitted: 27 Sep 2017

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