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Strong intravalley scattering in graphene induced by spin orbit coupling

Lihuan Sun,¹ Louk Rademaker,³ Diego Mauro,^{1,2} Alessandro Scarfato,¹ Árpád Pásztor,¹ Ignacio Gutiérrez-Lezama,^{1,2} Zhe Wang,⁴ Alberto F. Morpurgo,^{1,2} and Christoph Renner¹

¹ *Department of Quantum Matter Physics, University of Geneva, Geneva, Switzerland*

² *Department of Applied Physics, University of Geneva, Geneva, Switzerland*

³ *Department of Theoretical Physics, University of Geneva, Geneva, Switzerland*

⁴ *MOE Key Laboratory for Nonequilibrium Synthesis and Modulation of Condensed Matter, School of Science, Xi'an Jiaotong University, Xi'an, China*

Understanding the role of spin orbit coupling in the electron scattering process in graphene is central to realizing future electronics based on the proximity effect in graphene/TMD heterostructures. Here we detect the electron scattering processes in a graphene/WSe₂ heterostructure by Fourier transform scanning tunneling microscopy (FT-STM). Besides the intervalley scattering, significant intravalley scattering is observed, which is forbidden in bare graphene. Based on theoretical calculations, we demonstrate that spin orbit coupling induced in Graphene by proximity to the TMD enables the observed intravalley scattering. Our results highlight the importance of spin orbit coupling to understand and tune electron scattering processes in two-dimensional materials.