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Unravelling the intrinsic and robust nature of van Hove singularities in twisted bilayer graphene FELIX YNDURAIN, IVAN BRIHUEGA, Dept. Física de la Materia Condensada, Universidad Autónoma de Madrid, E-28049 Madrid, Spain, PIERRE MALLET, Institut Néel, CNRS-UJF, BP 166, F-38042 Grenoble, France, HECTOR GONZALEZ-HERRERO, Dept. Física de la Materia Condensada, Universidad Autónoma de Madrid, E-28049 Madrid, Spain, GUY TRAMBLY DE LAISSARDIÈRE, Laboratoire de Physique Théorique et Modélisation, Université de Cergy-Pontoise-CNRS, F-95302 Cergy-Pontoise, France, MIGUEL UGEDA, JOSE MARIA GÓMEZ-RODRÍGUEZ, Dept. Física de la Materia Condensada, Universidad Autónoma de Madrid, E-28049 Madrid, Spain, LAURENCE MAGAUD, JEAN YVES VEUILLEN, Institut Néel, CNRS-UJF, BP 166, F-38042 Grenoble, France — Extensive scanning microscopy and spectroscopy experiments completed by first principles and parameterized tight binding calculations provide a clear answer to the existence, origin and robustness of van Hove singularities in twisted grapheme layers. Our results are conclusive: vHs due to interlayer coupling are present in abroad range of rotation angles. From the variation of the energy separation of the vHs with rotation angle we recover the Fermi velocity of the grapheme monolayer as well as the strength of the interlayer interaction. The robustness of the vHs is assessed both by experiments and calculations which test the role of the periodic modulation and absolute value of the interlayer distance. We clarify the origin of the moiré corrugation observed in the STM images.

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