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**Theory of inter-edge superexchange in zigzag edge magnetism**

JEIL JUNG, Department of Physics, University of Texas at Austin, USA, TAMI PEREG-BARNEA, Physics Department, California Institute of Technology, USA, ALLAN MACDONALD, Department of Physics, University of Texas at Austin, USA — A graphene nanoribbon with zigzag edges has a gapped magnetic ground state with an antiferromagnetic inter-edge superexchange interaction. We present a theory based on the asymptotic properties of the Dirac-model ribbon wavefunction which predicts  $W^{-2}$  and  $W^{-1}$  ribbon-width dependences for the superexchange interaction strength and the gap respectively. Unlike in conventional superexchange we find that both the kinetic and exchange energy contributions favor the antiferromagnetic inter-edge coupling with a dominant role of exchange several times larger in magnitude than the kinetic energy contribution.

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