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The Interplay of the Coulomb potential and transverse gate potential in Anti-ferromagnetic Order in AA-Stacked Bi-layer Graphene: A Tight Binding Study

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Abstract. In order to describe the anti-ferromagnetic spin ordering in AA-stacked bi-layer graphene, we have proposed a tight- binding model Hamiltonian consisting of nearest-neighbor $2P_z$ electron hopping of carbon atom and the interlayer electron hopping. The on-site Coulomb potential introduces the anti-ferromagnetic order in the system. We have assumed that the spin ordering of one carbon atom in a layer is opposite to that of the neighboring carbon atoms. We have introduced a transverse gate potential which can tune the anti-ferromagnetic order in the system. The Hamiltonian is solved by Zubarev's Green's function technique. Finally the temperature dependent anti-ferromagnetic gap is derived from the correlation functions obtained from the Green's functions and consequently the results are discussed.

Keywords: Graphene, Anti-ferromagnetism, AA-stacked bi-layer graphene

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