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Broken Symmetry Phases in ABC Trilayer Graphene[1] VLADIMIR CVETKOVIC, OSKAR VAFEK, National High Magnetic Field Laboratory, Florida State University — We study the effects of electron-electron interaction in ABC-stacked trilayer graphene (TLG) within the framework of weak coupling renormalization group (RG). We find that, when the interaction is mainly in the forward scattering channel, the system orders into a gapless phase characterized by breaking of the TLG lattice mirror symmetries. A presence of small but finite back scattering changes the nature of the leading instability and results in gapped phases. The repulsive back scattering favors layered anti-ferromagnetic order, while the attractive back scattering yields the quantum spin Hall phase (gapped in bulk only). By classifying order parameters in TLG according to irreducible representations of the TLG space group, we conclude that any orders that break the rotational symmetry (e.g., the nematic state) in TLG are disfavored compared to the orders that do not break the lattice trifold rotational symmetry. The results are discussed in the context of present experiments on TLG.

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