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Valley order and loop currents in graphene on hexagonal boron nitride[1] BRUNO UCHOA, University of Oklahoma, VALERI KOTOV, University of Vermont, MARKUS KINDERMANN, Georgia Tech University — In this letter, we examine the role of Coulomb interactions in the emergence of macroscopically ordered states in graphene supported on hexagonal boron nitride substrates. Due to incommensura- tion effects with the substrate and interactions, graphene can develop gapped low energy modes that spatially conform into a triangular superlattice of quantum rings. In the presence of these modes, we show that Coulomb interactions lead to spontaneous formation of chiral loop currents in bulk and to macroscopic spin-valley order at zero temperature. We show that this exotic state breaks time reversal symmetry and can be detected with interferometry and polar Kerr measurements.

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