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Casimir Force Phase Transitions in the Graphene Family WILTON KORT-KAMP, Los Alamos National Laboratory, PABLO RODRIGUEZ-LOPEZ, University of South Florida, DIEGO DALVIT, Los Alamos National Laboratory, LILIA WOODS, University of South Florida — The Casimir force is a universal interaction induced by electromagnetic quantum fluctuations between any types of objects. The expansion of the graphene family by adding silicene, germanene, and stanene is a promising platform to probe Dirac-like physics in honeycomb staggered systems in such a ubiquitous interaction. Here, we discuss the quantum mechanical regime of the Casimir interaction between layers of the graphene family. We discover Casimir force phase transitions between these staggered 2D materials induced by the complex interplay between Dirac physics, spin-orbit coupling, and externally applied fields. We find that the interaction energy experiences different power law distance decays, magnitudes, and dependences on characteristic physical constants. Furthermore, due to the topological properties of these materials, repulsive and quantized Casimir interactions are possible. Finally, thermal corrections to the Casimir interaction owing to finite temperature of the system are also addressed.

Wilton Kort-Kamp
Los Alamos National Laboratory

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