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Improving Limits on Exotic Spin Dependent Long Range Forces using Double Boson Exchange SHEAKHA ALDAIHAN, WILLIAM MICHAEL SNOW, Indiana University, Bloomington, IN, DENNIS KRAUSE, Wabash College, Crawfordsville, IN, JOSHUA LONG, Indiana University, Bloomington, IN — Experimental search for unobserved forces above the submillimeter scale has been an active area of research over the last two decades. The existence of very light weakly interacting particles that mediate such forces has been suggested in many extensions of the Standard Model. The fact that the dark energy density corresponds to a length scale of about 100 μm also encourages searches for unobserved phenomena at this length scale. Parameterizations of forces in this range show that they can be represented as corrections to the gravitational and electromagnetic forces and have both spin-dependent as well as spin independent components. Very stringent limits on spin-independent couplings exist. For long-range spin dependent forces, limits are weaker by approximately 20 orders of magnitude compared to their spin independent analogs. The disparity in the limits raises the question of whether interesting limits on spin dependent couplings can be inferred from spin independent searches for long range forces. We show that this is possible using higher order contributions corresponding to double boson exchange and derive all possible long range forces arising from double boson exchange. We obtain improved limits on some spin dependent couplings using the leading effects from two boson exchange forces and a recently performed spin independent experiment.

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