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Van-der-Waals shifts of rubidium Rydberg states TARA CUBEL LIEBISCH, AARON REINHARD, BRENTON KNUFFMAN, PAUL BERMAN, GEORG RAITHEL, FOCUS Center, University of Michigan — We present calculations of van der Waals energy shifts of Rb Rydberg-atom pairs for different quantum numbers n, l, j and m_j, taking into account a large number of perturbing states. For $D_{5/2}$-states we find that over the range of $54 < n < 86$ the van-der-Waals shift scaled by R^6/n^{11} is nearly constant, and that the shift does not vary by more than 50% as a function of the relative atomic orientation. This result is consistent with recent experimental work, in which we have studied the effect of a Rydberg-excitation blockade on the probability distribution of the number of Rydberg atoms detected in small atomic ensembles. In these experiments it was found that the counting statistics is sub-poissonian, and that its Mandel Q-parameter exhibits a smooth dependence on n. The calculations further show that the shifts of the $D_{5/2}$, $D_{3/2}$, $P_{3/2}$, $P_{1/2}$ and $S_{1/2}$-levels exhibit qualitatively different behavior. How these differences might effect future experiments will be discussed.

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