

Abstract Submitted
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Dipole-dipole broadening of $ns-np$ Rydberg transitions¹ HYUN-
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TEAM — Using a microwave resonance technique we have measured the dipole-
dipole broadening of $ns-np$ transitions of $300\mu K$ Rb Rydberg atoms. The experi-
ment has been done with $n=28, 29, 34, 39, 44,$ and 50 states, all of which exhibit
a linear increase in the linewidth with atomic density. The broadening rate varies
as n^4 , which is to be expected since $\mu_{sp} \approx n^2$. The broadening is not Lorentzian,
but results in asymmetric, cusp shaped resonances. To reproduce the observed reso-
nances we have developed a molecular model in which pairs of atoms are driven from
the $nsns$ to the $nsnp/npns$ states, which have a dipole-dipole energy splitting which
scale as $1/R^3$. We calculate the dipole-dipole splitting of the $nsnp/npns$ states, and
the transition strengths from the $nsns$ states with the spins of the two electrons in-
cluded. The results, averaged over the density of Rydberg atoms, yield asymmetric
cusp shaped resonances, which agree very well with the observations.

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