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Long-range Rydberg-Rydberg interactions and molecular resonances JOVICA STANOJEVIC, ROBIN CÖTÉ, University of Connecticut, Storrs, CT 06269 — We present a detailed theoretical treatment to describe the lineshape of molecular resonances in a cold dense gas of rubidium Rydberg atoms. We calculate molecular potentials in Hund's case (c) by diagonalization of an interaction matrix and show how the strong ℓ -mixing due to long-range Rydberg-Rydberg interactions can lead to resonances in excitation spectra. Such resonances were first reported in S.M. Farooqi *et al.*, Phys. Rev. Lett. **91** 183002, where single UV photon excitations from the 5s ground state to np Rydberg states occurred at energies corresponding to normally forbidden transitions or very far detuned from the atomic energies. Here, we focus our attention on resonances at energies corresponding to excited atom pairs $(n-1)p_{3/2} + (n+1)p_{3/2}$. We find a very good agreement between our theoretical and experimental lineshapes.

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