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The resonant Energy transfer Rb ns +Rb ns +2hν →Rb np$_{1/2}$ + Rb np$_{3/2}$ in a frozen Rydberg gas[1] JIRAKAN NUNKAEW, RAHEEL ALI*, THOMAS GALLAGHER, University of Virginia — We have observed the process Rb ns +Rb ns +2hν →Rb np$_{1/2}$ + Rb np$_{3/2}$ from n=34 to n=41 in a frozen gas of Rb Rydberg atoms. It is resonant when the microwave frequency is halfway between the ns→np$_{1/2}$ and ns→np$_{3/2}$ frequencies. The frequencies range from 57 to 106 GHz. The process can not occur in isolated atoms, nor can it occur if the magnetic quantum numbers are unchanged, an implicit assumption of one dimensional models. A Floquet-Forster model shows that the coupling between the initial and final states involves the absorption of two microwave photons and the dipole-dipole interaction, which leads to a coupling proportional to the product of the density, the microwave field squared, and n^{14}. We have experimentally verified these dependences. The observed resoannces are asymmetric, with a low frequency tail, which we attribute to the van der Waals shift of the final np$_{1/2}$np$_{3/2}$ state due to its dipole-dipole interaction with the nearby ns(n+1)s state. While the van der Waals shift is negligible for most of the atoms in the Rydberg gas, it is not for the pairs of close atoms which undergo this transition. *permanent address: Quaid-i-Azam University

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