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Single and multi photon molecular transitions of cold Rb Rydberg atoms[1] JEONGHUN LEE, Univ of Virginia, JAVED IQBAL, University of Azad and Kashmir, Muzaffarabad, TOM GALLAGHER, Univ of Virginia — Microwave transitions between pair states composed of two Rb Rydberg atoms in a magneto-optical trap are investigated. This is an extension of the experiment to investigate the transition from ndnd to (n+1)d(n-2)f states, which is allowed because the (n+2)p(n-2)f state that is energetically close to ndnd state is admixed into the ndnd state as a result of the dipole-dipole induced configuration interaction between the two states. The microwave transition is from the (n+2)p(n-2)f part of the wavefunction to the (n+1)d(n-2)f state. The microwave drives a transition from (n+2)p to another state in one atom with the other atom remaining a spectator in the (n-2)f state. In this follow up experiment, a series of one, two, and three photon microwave transitions that occur due to the same mechanism was observed. More specifically, microwave transitions from ndnd to (n+3)s(n-2)f, (n+3)p(n-2)f, and (n+4)s(n-2)f as well as from nsns to (n-1)d(n-2)p were observed. The measured frequencies were found to agree well with the calculated values. The ac Stark shifts and transition probabilities for the transitions can be explained using a Floquet approach.

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