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Optical up-conversion in Er^{3+}:Y_2O_3 nanoparticles through spectral masking of broadband pump light[1] LAUREN TULCHINSKY, AMY LYTLE, ETIENNE GAGNON, KEN KREBS, Franklin & Marshall College, ELIZA JONATHAN, ANN SILVERSMITH, Hamilton College — Up-conversion photoluminescence (UC-PL) has been extensively studied for potential use in up-conversion lasers, IR to visible detectors, and high efficiency lighting applications. Here we report experimental results exploring the excited state absorption process behind the UC-PL of Er^{3+} : Y_2O_3 nanoparticles under shaped-pulse laser excitation. By beginning with a broadband laser pulse and then spectrally shaping it to remove either the high or low energy part of the excitation, we examine the full width of the double resonance between the ground-to-excited state absorption and the excited state absorption of the impurity ions. We propose a model for the manifolds of the electronic energy states that treats each Stark level as a Gaussian of fixed width and then superimposes a Boltzmann distribution for the thermalized population of the levels. This simple model fits the experimental data well at room temperature, but begins to show expected differences at 78 K.

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