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RADIATIVE ENERGY TRANSFER AND "NON-NATURAL" EXCITATION IN THE QUANTUM EFFICIENCY DETERMINATION OF 1.55 μm Er^{3+} EMISSION IN SILICA FIBERS

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*CNET, Laboratoire de Bagneux, 196 av. H. Ravera, F-92220 Bagneux, France***ABSTRACT**

One of the most usual way to determine quantum efficiency of Rare Earth ions in solids is to compute the radiative lifetime (τ_r) of the considered level through Judd's theory and to measure the emission decay time (τ) ; the ratio $\eta = \tau/\tau_r$ being the desired quantum efficiency. By such way the quantum efficiency of Er^{3+} at 1.55 μm in silica fibers is estimated to be 100% [1]. However a number of pitfalls can be encountered [2] in such determination, namely radiative energy transfer and "non-natural" excitation linked with crystal field splittings. The purpose of this paper is to show that, taking such effects into account, Er^{3+} efficiency at 1.55 μm is found to be much less in silica fiber than usually accepted.

We show that quantum efficiency of Er^{3+} in silica fibers should range between 30 to 45% instead of the 100% usually believed.

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