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RADIATIVE ENERGY TRANSFER AND "NON-NATURAL" EXCITATION IN THE QUANTUM EFFICIENCY DETERMINATION OF 1.55 μm Er³⁺ EMISSION IN SILICA FIBERS

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ABSTRACT

One of the most usual way to determine quantum efficiency of Rare Earth ions in solids is to compute the radiative lifetime (τᵣ) of the considered level through Judd's theory and to measure the emission decay time (τ); the ratio η = τ/τᵣ being the desired quantum efficiency. By such way the quantum efficiency of Er³⁺ 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, Er³⁺ efficiency at 1.55 μm is found to be much less in silica fiber than usually accepted.

We show that quantum efficiency of Er³⁺ in silica fibers should range between 30 to 45% instead of the 100% usually believed.

REFERENCES
