

Title: Stimulated emission cross section at various temperatures based on laser performance

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Abstract: The determination of stimulated emission cross sections at various temperatures is reported. Neodymium doped yttrium orthovanadate crystal (Nd:YVO₄) was employed as a gain medium. The temperature of the crystal holder varied between 20 and 60 °C. The cross section was determined based on laser performance. The slope efficiency of the diode end-pumped Nd:YVO₄ laser system decreased from 40.2% to 31.7%, while the threshold power increased from 0.744 to 1.028 W. The far-field beam diameter increased linearly with the absorbed pump power at a constant temperature. There was no correlation between the rate of change of the beam diameter with temperature due to mechanical stress fluctuation. The stimulated emission cross section was found to decrease at a rate of -0.45% °C⁻¹ which concurs with previous works. The stimulated emission cross section of various solid-state gain mediums can be determined through this method.