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Abstract:Based on the theory of semi-classical density matrix and a model of double threeenergy-level (DTEL) system for laser line competition in optically pumped D$_2$O superradiant terahertz laser (THz Laser), the mathematical expressions of gain coefficients for pumping signal and THz laser signal are deduced, and the competition between 66μm and 116 μm laser lines is calculated numerically by means of iteration method. The effects of the operation conditions (including pump power, working gas pressure and the length of cavity) on the competition are analyzed. It is found that 66μm emission dominated the competition; with the increase of working gas pressure (or the cavity length), the spectrum of 66μm emission experiences changes from discrete double-peak structure to overlapped doublepeak structure and finally to a wide-band structure, and the optimum gas pressure varied conversely with the optimum length of the TH$_Z$ laser cavity. © Springer Science+Business Media, LLC 2012.

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