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- Abstract** : This work presents a new theoretical model for  $Ti^{3+}$  ions in the GaP semiconductor. The symmetry for this system is a tetrahedral symmetry. The theoretical model is used to explain the results of Zeeman photoluminescence experimental measurements taken from published experimental works. The effective Hamiltonian of this system has been constructed and a computer program is used to determine the parameters of this Hamiltonian. These parameters are used to predict the energies of PL lines versus magnetic field and to calculate the transition probabilities which are found to be in very good agreement with the experimental data
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