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# Fermi Resonances and Vibrational Spectrum of a Polyatomic Molecule $XY_4$: an Algebraic Approach

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Abstract: A U(2) algebraic model is introduced for the spectrum of a molecule $XY_4$, where the interactions between the stretch and bend modes are described by $T_d$ symmetric Fermi resonance terms. The presented algebraic model in a limit corresponds to another model in recent literature. The vibrational spectrum of methane ($CH_4$) measured recently with modern spectroscopy techniques is employed to test those models. The obtained standard deviation between the observed and the calculated vibrational energy levels in the algebraic model is smaller than that in the corresponding model.

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