Mercury dimer in its ground and excited states. Interatomic potentials for photoassociation and quantum-mechanics tests

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Recently, a precise knowledge about potential energy (PE) curves of mercury dimer (Hg_2) has been engaged in experiments of femtosecond photoassociation spectroscopy. Photoassociation of Hg_2, femtosecond dynamics and quantum dynamical wave packet description of these reactions [1-3] as well as coherent bond formation of Hg_2 obtained in the femtosecond time scale [4] have been reported. Furthermore, results of mercury-dimer spectroscopy are used in planned fundamental experimental tests of quantum mechanics, particularly a realization of famous Einstein-Podolsky-Rosen (EPR) *gedankenexperiment* [5,6] and loophole-free test of the Bell inequalities in a regime different from those using photons [6,7]. Therefore, it is highly desirable to have a knowledge on the accuracy of Hg_2 PE curves, especially those involved in the above considerations. An improved characteristics based on rigorous analysis of the $F0_u^+$ (6^3P_1)-$X0_g^+$, $D1_u(6^3P_1)$-$X0_g^+$ and $E1_u(6^3P_2)$-$X0_g^+$ transitions in excitation and fluorescence spectra obtained in the experiments of crossed supersonic and laser beams will be presented. The results considerably extend previously reported investigations [8].

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