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Probing the nonlocal resonance model of electron collisions with diatomic molecules[1] KAREL HOUFEK, PREMYSL KOLORENC, MICHAL TARANA, Charles University in Prague, THOMAS N. RESCIGNO, LBNL, C. WILLIAM MCCURDY, UC Davis & LBNL — The nonlocal resonance model [W. Domcke, Phys. Rep. 208, 97 (1991)] to nuclear dynamics of low-energy resonant collisions of electrons with molecules was successfully applied to many diatomics. We show how underlying assumptions of this theory can be tested using a simple model of the electron-molecule collisions with one electronic and one nuclear degree of freedom, which was introduced by the authors [Phys. Rev. A 73, 032721 (2006)] and which can be solved numerically exactly without the Born-Oppenheimer approximation. The basic result of our investigation is that the "background" contribution to the cross sections can be significant even for inelastic collisions such as vibrational excitation of the molecule F2. Moreover the Fano-Feshbach R-matrix theory [B.M. Nestmann, J. Phys. B 31, 3929 (1998)] which was proposed to provide parameters of the nonlocal resonance model has been recently tested within our model and its drawbacks are discussed.

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