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**Electron-impact vibrational excitation of molecular hydrogen**[1]
DMITRY FURSA, LIAM SCARLETT, JEREMY SAVAGE, IGOR BRAY, Curtin University, MARK ZAMMIT, Los Alamos National Laboratory — Electron-impact vibrational excitation of molecular hydrogen in the ground electronic state is one of the most fundamental processes in electron-molecule scattering. The production of vibrationally-excited $H_2$ is of importance in modelling hydrogenic plasmas, as the cross sections for electronic excitation and dissociation have a strong dependence on the initial vibrational level. Above the electronic inelastic threshold, the dominant mechanism for vibrational excitation is electronic excitation followed by radiative cascade. Modeling this process requires a fully vibrationally-resolved description of the scattering problem. Previous calculations were performed with the impact-parameter method [Celiberto *et al*, At. Data Nucl. Data Tables **77** (2001) 161], which is known to significantly overestimate cross sections. Using the CCC method, we have performed calculations of excitation-radiative-decay leading to vibrational excitation of $H_2$ [Scarlett *et al*, Plasma Sources Sci. Technol. **28** (2019) 025004]. At lower energies, direct vibrational excitation is the only mechanism for producing vibrationally excited $H_2$. Here we also present vibrational close-coupling calculations of electronic-elastic vibrational excitations at low energies.

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