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Complete collision data set for electron scattering from molecular hydrogen and its isotopologues[1]

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Cross sections resolved in the rovibrational levels of the target are required for determining the properties and dynamics of many low-temperature plasmas. We have applied the Molecular Convergent Close-Coupling (MCCC) method to produce a comprehensive set of vibrationally-resolved cross sections for electron collisions with molecular hydrogen and its isotopologues comprised of more than 57,000 entries [1]. This complete collision data set is available to the research community via the LXCat database and the dedicated MCCC database (mccc-db.org). For H_2 the data set includes transitions from all 14 vibrational levels of the ground electronic state to all vibrational levels of 18 excited electronic states (all states in the $n = 2, 3$ shells). Examples of modeling calculations based on the MCCC dataset will be presented for collisional-radiative (CR) modelling and Monte-Carlo simulation of electron propagation in H_2 plasmas. A study of electron scattering from the metastable $c\ ^3\Pi_u(v = 0)$ state of H_2 will be presented and progress towards establishing a comprehensive dataset of vibrationally-resolved cross sections for transitions between excited levels will be discussed. [1] Scarlett et al., Atom. Data. Nucl. Data Tables (2020), submitted. Coauthors: L. H. Scarlett, I. Bray, M. C. Zammit, Yu. Ralchenko.