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Electronic excitation of molecular hydrogen by low-energy electrons

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Molecular hydrogen is the most abundant element in the universe, particularly in interstellar plasmas such as atmospheres of gas giant planets and stars. Electron collision data for hydrogen is critical to interpreting the spectroscopy of interstellar objects, as well as being of applied value for modelling technological plasmas. Hydrogen is also fundamentally interesting, as while highly accurate wave functions for this simple molecule are available, providing an accurate, ab initio, treatment the collision dynamics has proven challenging, on account of the need to have a complete description of channel coupling and polarization effects. To date, no single theoretical approach has been able to replicate experimental results across all transitions and incident energies, while the experimental database that is available is far from complete and not all available measurements are in satisfactory agreement. In this talk, we present differential and integral cross section measurements for electronic excitation cross sections for molecular hydrogen by low-energy electron impact. The data were measured at incident energies below 20eV, using a well-tested crossed beam apparatus and employing a moveable gas source approach to ensure that background contributions to the scattering are accurately accounted for. These measurements are compared with new theoretical results employing the convergent close coupling approach.