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Databases for radiative emission probabilities of molecular hydrogen and simulation of experiments.

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We present tables of emission probabilities from Rydberg states of H_2 , D_2 and HD published in publicly available databases. The tables can be used to simulate various VUV spectra observed in astrophysical environments or obtained in laboratory experiments. (A recent example is displayed by VUV emission from H_2 excited by monoenergetic electron beams [1].) As pure ab-initio calculations may give rise to significant discrepancies with very high resolution experiments, we have combined a semi-empirical treatment and ab-initio informations to compute line emission transition probabilities and the corresponding wavenumbers. Lyman B-X, Werner C-X, B'-X, D-X VUV emission probabilities of H_2 and D_2 are available in the MOLAT database [2]. Tables of the radiative lifetime and spontaneous radiative dissociation probabilities of excited electronic levels of H_2 are obtained from the CDS base [3]. We have performed ab-initio calculations of VUV emission probabilities of HD and published the data in the CDS database [4].
We present here a comparison between experiments performed at JPL at a resolution of 3 AA [5] and recent calculations of infrared and visible emission probabilities of H_2 arising from excited gerade Rydberg electronic states. Such an emission may only take place from electron excitations followed by radiative cascades. The radiative transitions occur between the upper g-states (EF, GK, HH, P, O, I, R, J, S) and the intermediate u-states (B, B', C, D) in the infrared or visible window, and subsequently in the VUV via the transition to the X ground electronic state.

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