DETERMINATION OF THE IONIZATION AND DISSOCIATION ENERGIES OF MOLECULAR HYDROGEN, H_2

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The transition wave number from the $EF\ ^1\Sigma_g^+(v = 0, N = 1)$ energy level of ortho-H_2 to the $54p1_1(0)$ Rydberg state below the $X^+\ ^2\Sigma_g^+(v^+ = 0, N^+ = 1)$ ground state of ortho-H_2^+ has been measured to be $25209.99756 \pm (0.00022)_{\mathrm{statistical}} \pm (0.00007)_{\mathrm{systematic}}$ cm^{-1}. Combining this result with previous experimental and theoretical results for other energy level intervals, the ionization and dissociation energies of the hydrogen molecule have been determined to be 124417.49113(37) cm^{-1} and 36118.06962(37) cm^{-1}, respectively, which represents a precision improvement over previous experimental and theoretical results by more than one order of magnitude. The new value of the ionization energy can be regarded as the most precise and accurate experimental result of this quantity, whereas the dissociation energy is a hybrid experimental-theoretical determination.