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Calculation of Bethe Logarithm by Drake-Goldman Method to Hydrogen Molecular Ions ZHEN-XIANG ZHONG, TING-YUN SHI, Division of Theoretical and Interdisciplinary Research, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, Wuhan 430071, China, ZONG-CHAO YAN, Department of Physics, University of New Brunswick, Fredericton, New Brunswick, Canada E3B 5A3 — Precision spectroscopy of hydrogen molecular ions can be used to determinate proton to electron mass ratio m_p/m_e. Several experiments are carrying out to measure rovibrational transition of HD^+ to a precision of 10^{-9}, and two photon transition of H_2^+ to 10^{-10} level. Current theoretical calculations are as precision as 10^{-10}, which are done by calculate relativistic and radiative corrections up to $R_\infty\alpha^5$ order. Uncertainty of $R_\infty\alpha^2$ order corrections have been reduced to sub kHz for H_2^+ states $(v, L) : (0, 0), (0, 1), (1, 0)$ and HD^+ rovibrational states $(v = 0 - 4, L = 0 - 4)$. Bethe Logarithm appeared in $R_\infty\alpha^3$ order corrections has been calculated to more than 8 digits for H_2^+ and HD^+ rovibrational states $(v = 0 - 4, L = 0 - 4)$. In this poster, we will report our recent work on Bethe Logarithm, which is calculated by Drake-Goldman method. The work was supported by the NSFC under Grants No. 11004221 and No. 10974224, by the National Basic Research Program of China (973 Program) under Grant No. 2010CB832803, and by the NSERC of Canada. The work was carried out at the computing facilities of SHARCnet of Canada and Wuhan University of China.

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