B.1.4. Impact Ionization of Helium by Antiprotons Below 40 keV--*Teck G. Lee, H.C. Tseng* and C.D. Lin*

We have employed close-coupling calculations to evaluate the total impact ionization cross sections of He by antiprotons from 1 keV to 300 keV by expanding the time-dependent two-electron wavefunctions in terms of the eigenstates of the helium atom. The ionization channels are represented by pseudostates. To check the convergence of the calculations various basis sets have been used. The total cross sections we obtained are higher than the experimental data [1], but only slightly higher than the results of Reading *et al*., [2]. Although our results are closer to the experimental data than many previous calculations, which employed independent electron approximations, the discrepancy remains even in our calculation in which electron correlation has been accounted for. We conclude that there is a need to repeat these measurements. This will be possible in view that a new antiproton ring is under construction at CERN and such experiments will be repeated. We have performed the calculations down to 1 keV, which is near the limit of the present semiclassical model. The results are to be compared with experiments in the future when the antiprotons are slowed down even further. The results from our calculations are compared to the experimental data [1,3] and other calculations in Fig. 1.

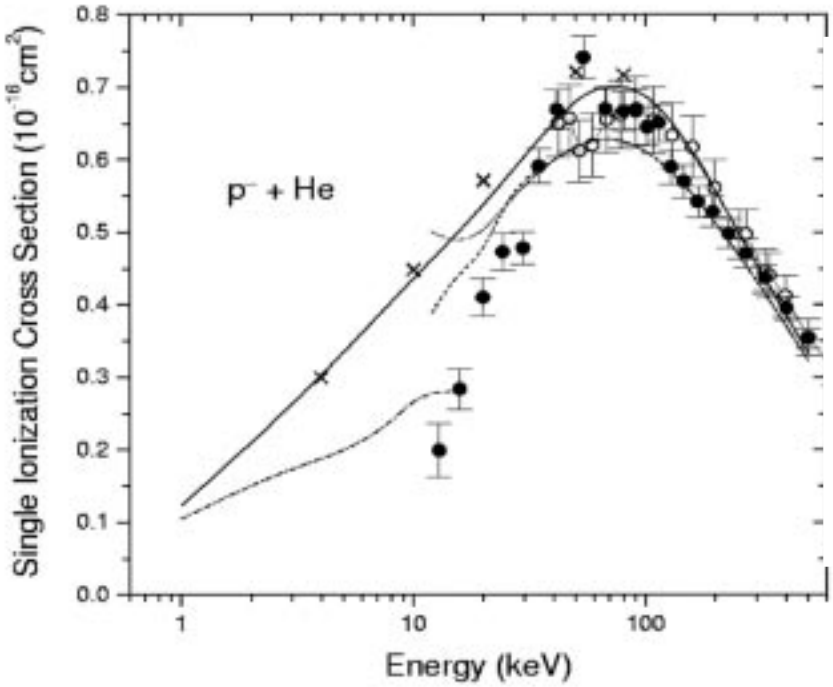

Figure. 1. Total ionization cross sections for antiprotons colliding with He. Experiments: solid circles, [1]; open circles, [3]. Theoretical results: solid line, from our work; crosses, from our work with a different basis set; dashed lines, multi-cut FIM theory, [2]; dotted lines, one-cut FIM theory, [2]; dash-dotted lines, from hidden crossing theory [4].

References

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