

# Evaluation of $1s212l'$ $^4P/{}^2P$ , ${}^2P_+/{}^2P_-$ and ${}^2D/{}^2P$ ratios from collisions of mixed state ( $1s^2$ , $1s2s$ ${}^3S$ ) He-like ion beams with $H_2$ and He targets\*

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New results are presented on the ratio  $R$  of  ${}^4P/{}^2P$  populations of Li-like  $1s2s2p$  quartet and doublet  $P$  states formed in energetic ion-atom collisions by single  $2p$  electron transfer to the metastable  $1s2s$   ${}^3S$  component of a He-like ion beam. Using spin statistics, a value of  $R=2$  is predicted, mostly in disagreement with reported measurements of  $R=3-10$  [1-2]. A new technique is used in the evaluation of  $R$  which overcomes the need for the normalization of the measured cross sections and allows for the determination of the separate contributions of ground- and metastable-state beam components to the measured spectra. Applying to spectra from 4.5 MeV  $B^{3+}$  [3] and 25.3 MeV  $F^{7+}$  [4] mixed state ( $1s^2$   ${}^1S$ ,  $1s2s$   ${}^3S$ ) ion collisions with  $H_2$  target, we report values of  $R=3.5\pm 0.4$  for boron and  $R=1.8\pm 0.3$  for fluorine. In addition, also reported for the first time are the ratios of  ${}^2D/{}^2P$  and  ${}^2P_+/{}^2P_-$  populations generated by either capture and/or Transfer Excitation mechanisms, providing essential information on the active processes that can affect the overall intensities of the measured Auger spectra. They are evaluated applying the same technique and compared to previously reported results for carbon collisions on He [1].

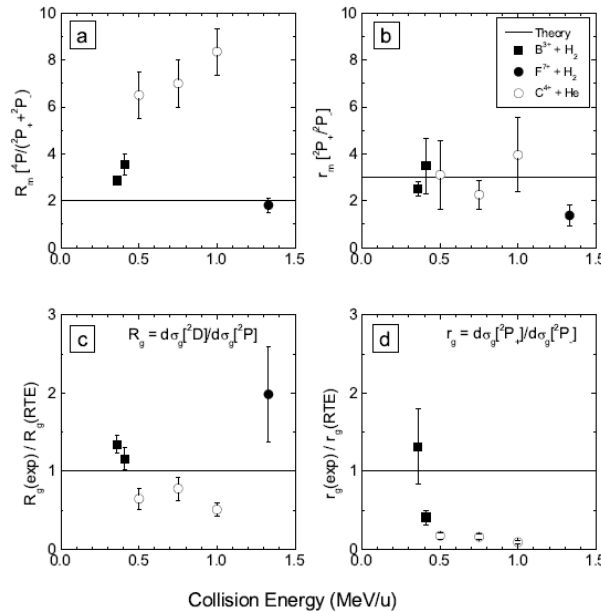


Figure 1: Theoretical and experimental ratios. The carbon on helium results are from [1].

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[3] E. P. Benis *et al.* Phys. Rev. A **65**, 064701 (2002).

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