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Complex q parameters for helium $L = 0, 1, 2$ autoionizing levels

N.L.S MARTIN, B.A. DEHARAK, University of Kentucky, K. BARTSCHAT, Drake University — We recently reported¹ out-of-plane (e,2e) experiments on He autoionization. The data were presented as angular distributions of ejected electrons from the three autoionizing levels 1S , 1D , and 1P and exhibited two well known features, the binary and recoil peaks. It was found that the recoil peak (relative to the binary peak) could be accurately reproduced by a second order distorted wave Born calculation using the R -matrix with pseudo-states approach, but not by the equivalent *first order* calculation, which underestimated the size of the recoil peak. It was also found that a plane wave Born approximation calculation could reproduce the results, but only if anomalously large values of Fano q -parameters were assumed. We will present an analysis of the first and second order calculations in terms of Fano q parameters. We find that for the first order calculations the q parameters are essentially real, but for the second order calculations they are complex, quantities. The 1D_2 parameters are particularly striking in this respect. This work was supported by the U.S. NSF under Grants No. PHY-0855040 (NLSM) and PHY-0757755 (KB).

¹B.A. deHarak, K. Bartschat, and N.L.S. Martin, *Phys. Rev. Lett.*, **100**, 063201 (2008).

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