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New type of asymmetries in two-center interferences observed in ion-molecular collisions¹

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In ion-atom collisions, the atomic version of double-slit experiments has been proposed by using two atomic centers as the double slits [1]. Recently, various two-center interference effects have been observed in different reaction channels such as ionization [2], capture [3], and the dissociative ionization [4]. These studies significantly advanced our knowledge of the double-slit interference in elastic processes. However, almost all studies so far focused on the interference effects rising from homo-diatomic molecules. Recently, we experimentally studied the interference effects in double capture collisions of He^{2+} on the hetero-diatomic molecule CO where the molecule played the role of an asymmetric ‘double-slit’, and the interference effects were examined in the molecular orientation spectra. It was found that, different from the homo-DM, the angular distributions of the hetero-DM present significant asymmetry. Such asymmetry of the interference pattern suggests certain phase of the ion collision processes has been mapped to the double-slit phase term. Therefore, atomic “double-slit” interference can be exploited to experimentally extract the phase information of ion collision processes and, furthermore, the methodology can be potentially used to manipulate the ion collision interactions. In this conference, we will report on such phenomena and the detailed analysis of the phase. References [1] T. F. Tuan and E. Gerjuoy, 1960 Phys. Rev. 117 756 [2] N. Stolterfoht et al. 2001 Phys. Rev. Lett. 87 023201 [3] L. P. H. Schmidt et al. 2008 Phys. Rev. Lett. 101 173202 [4] S. F. Zhang et al. 2014 Phys. Rev. Lett. 112 023201

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