The double-to-single photoionization cross-section ratios of deuterated benzene (C$_6$H$_3$D$_3$) have been obtained in the photon energy region between 25 and 160 eV. The measurements were carried out on the 6m-TGM (042) beamline using an ion time-of-flight spectrometer. In a previous experiment we have observed a modulation in the double-to-single photoionization ratio of C$_{60}$, which could be used to determine the structural dimensions of that molecule [1]. The C$_{60}$ molecule is a sphere consisting of carbon atoms arranged in pentagons and hexagons. Pure carbon hexagons do not exist in nature, but along with six hydrogen atoms it is the very common molecule benzene (C$_6$H$_6$). However, as our preliminary studies showed, C$_6$H$_6$ can fragment creating a C$_3$H$_3^+$ ion that has the same mass-to-charge ratio as the doubly charged benzene ion. In order to avoid this problem we have used deuterated benzene in the present investigation in order to see whether we can extract structural information from the data as in the case of C$_{60}$.

The double-to-single photoionization ratio curve of deuterated benzene reveals indeed a modulation. One weak local maximum in the ratio can be attributed to the C-C bond length as in the case of C$_{60}$. However, the largest “hump” in the ratio can not be readily assigned to a certain distance of the benzene molecule as has been done for C$_{60}$.

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