I. INTRODUCTION

Photodetachment of negative ions in the presence of a static electric field has been an active research area in the last decades [1–25]. The most interesting feature in the cross section is the induced oscillations above photodetachment threshold by the static electric field. The oscillations in the total cross sections can be understood using closed-orbit theory [26–28]. In an effort to understand the oscillations in various processes involving two-center system such as the photoionization cross section of diatomic molecule [29], the scattering of D_2 molecule by fast electron [30], a molecule in a strong laser field [31], above-threshold ionization [32] and harmonic generation [33], Afaq and Du extended the one-center H^- model for photodetachment and developed a two-center model for photodetachment[34–36]. They demonstrated the cross sections in the two-center system show strong oscillation which can be explained using closed-orbit theory. In particular, a detached electron orbit connecting the two centers is identified to be responsible for the oscillation in the total photodetachment cross sections of the two-center system.

To understand the structural information on linear triatomic negative anions such as $BeCl_2^-$,HCN^-,CS_2^- and CO_2^-[37], Afaq *et al.*[38] recently studied the photodetachment of a triatomic anion with three centers when the axis of the triatomic ion is perpendicular to the laser polarization direction. Interference patterns for detached-electron on a screen placed at a large distance from the system were demonstrated, but the total cross section was found to be smooth and no oscillation was observed for this configuration.

Here we extend the study of the total photodetachment cross section of the above triatomic anion system to the general case with an arbitrary laser polarization direction. We will derive analytic formulas for the total cross section which depends on photon energy, laser polarization direction and other parameters characterizing the triatomic anion. It will be shown that the cross section shows strong oscillations when the laser polarization is parallel to the system axis and the oscillation amplitudes gradually decrease to zero as the laser polarization is changed to be perpendicular to the axis. We also obtained the cross section averaged over the orientations of the system. We compare the cross section of the triatomic anion with that of the two-center system. The oscillations in photodetachment cross sections for the triatomic anion appear much enhanced compared to the two-center case. We find there are two oscillation frequencies in the triatomic anion. The two oscillations are