# Fission fragment folding angle distribution for the $^{18}O$+$^{232}Th$, $^{209}Bi$ systems near the coulomb barrier energies.

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Study of heavy ion induced fission fragment angular distributions performed around the Coulomb barrier yield information about the fission dynamics[1, 2]. In the measurements of fission fragment angular anisotropy and the folding angle measurement of the $^{16}O$+$^{232}Th$ system[3], the fission events due to the low momentum transfer and the full momentum transfer were separated[1]. The aim of the present experiment is to study the role of two neutrons in $^{18}O$ in fission fragment folding angle distribution on $^{232}Th$ target and compare it with the $^{16}O$ induced fission on the $^{232}Th$ with the similar excitation energy.

The experiment was performed at the BARC-TIFR Pelletron LINAC facility using 100.5, 110.9 and 125.3 MeV of $^{18}O$ beam. In the experiment self supporting $Th$ and $Bi$ targets of thickness 1.2 $mg/cm^2$ and 300 $\mu g/cm^2$ respectively were used. Two monitor detectors were placed at forward angles in order to normalize the data with the Rutherford cross section. The fragment fragment folding angular distribution measurements were performed by employing three $E$ (25-30 $\mu m$)-$\Delta E$ (300 $\mu m$) silicon detector telescopes and a Multi wire proportional counter (MWPC) gas detectors. The MWPCs used in the experiment had a window dimension of 17.5 $\times$ 7 cms. The gas detector was kept at a distance of 54.1 cm from the target ladder. The angular coverage of the MWPC detector was $35^o$. Isobutane gas pressure of 2.5 mbar was maintained in the MWPC with automated gas pressure handling system. Data was recorded in VME acquisition system. The pair of telescopes was taken to maximum back angles in order to cover angles close to $180^o$. Forward angle movement of MWPC was restricted due to the large count rate. The two telescope detectors in one arm of scattering chamber where placed to catch the fission fragment. In the other arm of the scattering chamber, MWPC was placed in folding angle to detect the complimentary fission fragments. The angular opening of the MWPC was enough to accept the complimentary fission events from the two silicon telescopes placed in the folding angle. Coincidences between the telescopes and MWPC were generated by a Time to Amplitude Converter (TAC). The start signal was taken from the anode of the MWPC and the stop was generated by ORing the signals of the two telescopes.

Figures 1 and 2 show fission folding angle distribution for the $Th$ and $Bi$ targets for 125.3, 110.9 and 100.5 MeV beam energy. The fission fragment folding angle distribution is taken by keeping telescope around $90^o$ and the MWPC (covering $34^o$ of angular opening) keeping at the theoretically calculated folding angle of the fission fragment from the compound nucleus. The fission fragment folding angular distribution for the bismuth target shows one distinct peak, whereas for the thorium target the fission fragment folding angular distribution shows three distinct peaks for the 125.3 MeV and two distinct peak like

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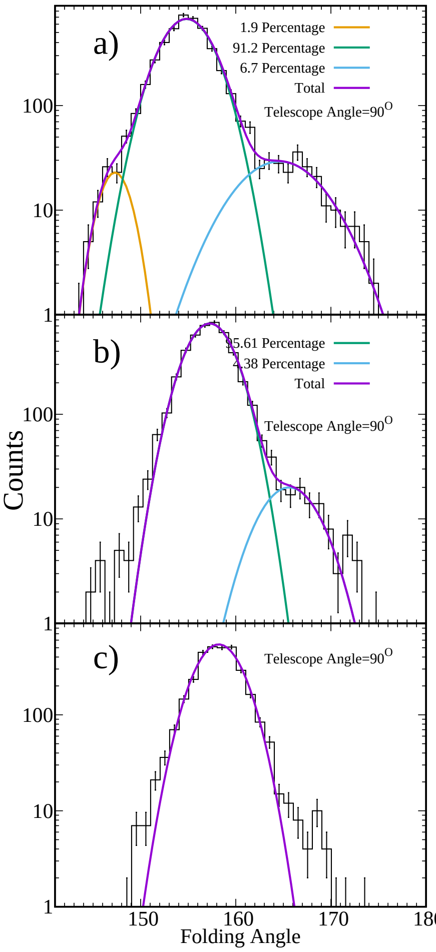


FIG. 1: Fission fragment folding angle data measured for $^{18}O$+$^{232}Th$ system measured at a) 125.3, b)110.9 and c) 100.5 MeV in the folding angle.

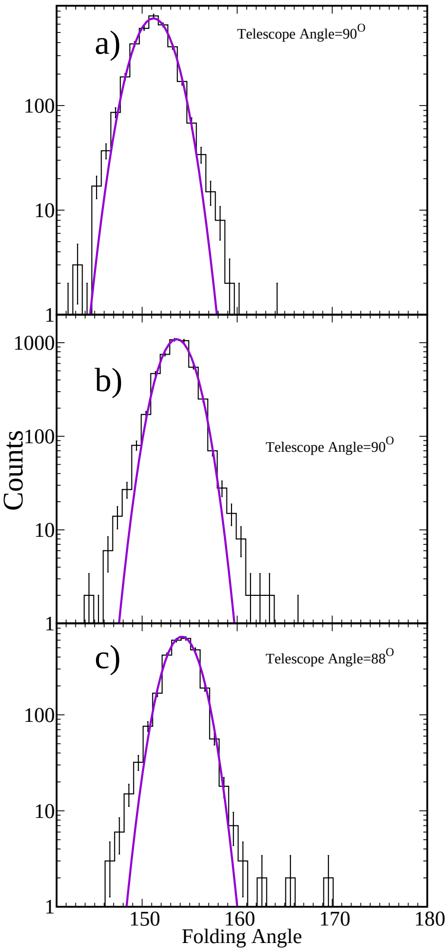


FIG. 2: Fission fragment folding angle data measured for $^{18}O$+$^{209}Bi$ system measured at a) 125.3, b)110.9 and c) 100.5 MeV in the folding angle.

structure for the 110.9 and 100.5 MeV. Peak by the fission folding angle distribution at the higher folding angles corresponds to incomplete momentum transfer or the transfer induced fission whereas the one at the lower fission folding angles results from the fission due to full momentum transfer. Similar structures were observed in Kailas *et al* in case of $^{16}O$+$^{232}Th$ system[1]. In the case of the $^{18}O$ induced fission reaction on $^{232}Th$ targets the fraction of transfer component to the total fission is observed to be around three to six percentage which is significantly different from the fraction observed by Kailas *et al* in the case of $^{16}O$ induced fission. The fraction of the transfer component for the $^{232}Th$ target is observed to be decreasing as energy decreases. Transfer induced fission has not been observed in case of $^{18}O$+$^{209}Bi$ system.

## References

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