was measured in the 1-10 nb range, in agreement with previous results of Ref. 1 and 2.

Future runs are planned at ^{3}He energies of 270 MeV and between 130 and 200 MeV to search for the threshold effect.

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MEASUREMENT OF THE TOTAL (p,π) CROSS SECTIONS THROUGH RESIDUAL ACTIVITY

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The total reaction cross section for the ^{209}Bi(p,γ+π°)^{210}Po reaction was measured in the energy range of 62-200 MeV at IUCF and 183-480 MeV at TRIUMF. The measurements were made using activation techniques and radio chemistry with α- and γ-ray spectroscopy. The excitation function, σ(E), for the combined (p,γ+π°) cross section hovers at the 1-10 μb level in this intermediate energy range as shown in Figs. 1a and 1b. In Fig. 1a the absolute total cross sections are plotted with an error of ~30%. These errors are due to the chemical yield determination (20%), beam intergration (5%), detection solid angle (5%), counting statistics (10%) and target thickness (5%). Renormalization to the (p,2n) product significantly reduces the overall uncertainty to a relative 12% uncertainty due mainly to statistics.

Below pion threshold (130.7 MeV) the radiative proton capture cross section decreases logarithmically with a $1/E^{2.12}$ dependence. Subtracting out the (p,γ) contribution, the residual (p,π°) cross section is shown in Fig. 2. Near the neutral pion threshold (below the neutron binding energy), the cross

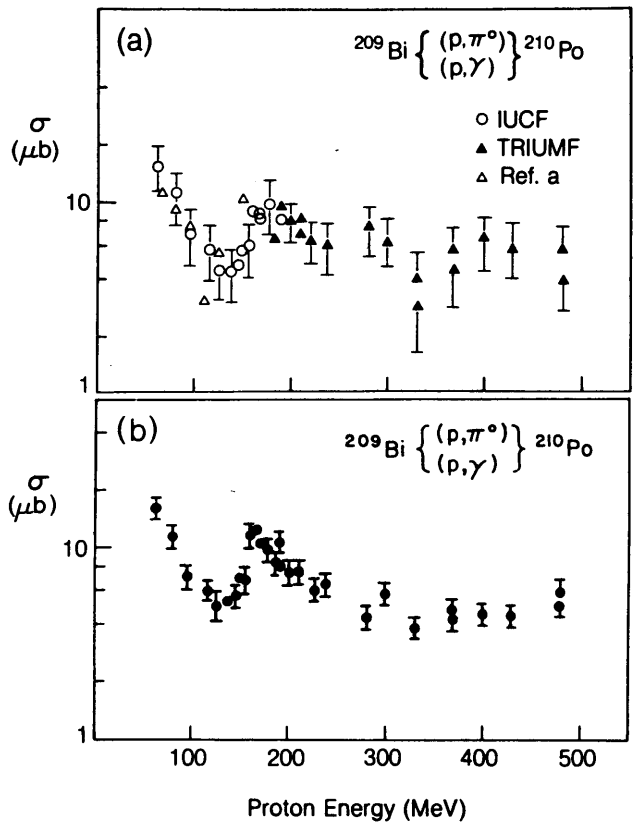

Figure 1. (a) Absolute cross sections for the ^{209}Bi(p,γ+π°)^{210}Po reaction; (b) renormalized data to the (p,2n) product. See text for discussion.

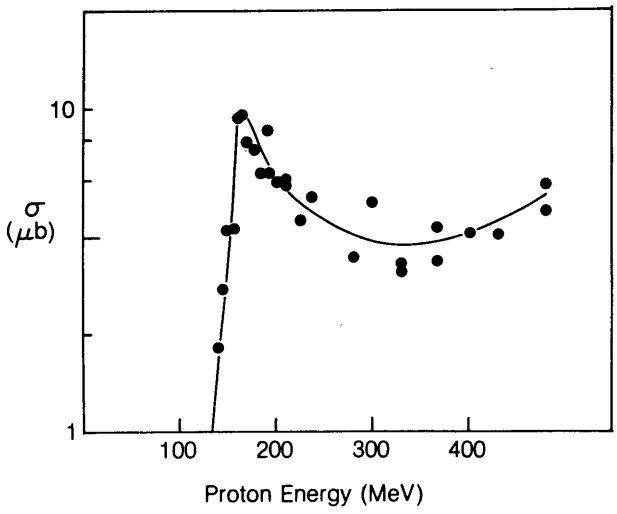

Figure 2. Estimated total cross section for the $^{209}Bi(p,\pi^{\circ})^{210}Po$ reaction.

section could be compared with total π° yield measurements using electronic techniques with Pb-glass and NaI detectors as a cross calibration check. Assuming a smooth excitation as drawn freely by the line in Fig. 2, the total uncertainty in the residual points would be about 30% for comparison.

In addition to the $(p,\pi^{\circ}+\gamma)$ study, the $(p,\pi^{-}xn)$ reaction was also studied radiochemically using similar techniques. Tentative results indicated production cross sections of several μb for the Astatine isotopes. Further measurements are needed in the At study to determine the contribution of secondary yields.

A manuscript of this work entitled "Radiochemical Study of the Combined (p,π°) and (p,γ) Reactions on Bismuth with Protons from 62-480 MeV" has been submitted for publication in Physical Review C (Intermediate Energy).