Anomalous Pion Production in Proton-Nucleus Collisions

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Several resent experiments of proton induced pion production on medium mass target nuclei revealed a considerable increase of pion yields at about 350 MeV proton energy with a relatively narrow width of about 5 MeV[1,2]. This resonance-like structure could be accounted for by a new phenomena in connection with non-nucleon degrees of freedom in nuclei. Normal nuclear excitations would be extremely broad at such a high excitation energy. We performed detailed measurements of excitation functions for positive pion production in proton-nucleus collisions at RCNP. The LAS spectrometer was used as pion detector. In order to confirm the reported resonance-like phenomena, the pion production cross section and the analyzing power were measured at several proton energies from 344 to 356 Mev in steps of about 1 MeV on Cu and at a pion production angle of 90 degrees. The error in the beam energy was no more than 0.1 MeV. The measured ratio of cross sections of high-energy (75-100MeV) to low-energy (30-60MeV) pion production was fitted with a sum of a quadratic polynome plus a Breit-Wigner term. We found a small enhancement at 351.8 MeV with a width of about 5.5 MeV. The preliminary result is shown in Fig.1.

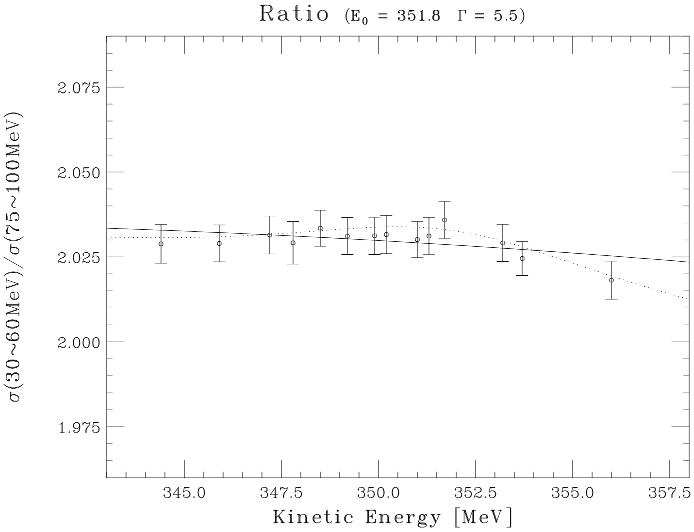

Figure 1: Bombarding energy dependence of the pion production . Solid and dotted lines are obtained by a least-square fit with a quadratic polynome and a Breit-Wigner term.

References

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[2] S. Yen et al., Physics Letters B **269** (1991) 59-62