

SENSITIVITY OF CHARGE ASYMMETRY PARAMETER TO COULOMB EFFECTS IN  $\pi^\pm$ -d  
ELASTIC SCATTERING

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Very accurate measurements of  $\pi^\pm$ -d elastic scattering below the  $\Delta$ -resonance have been performed in identical experimental conditions for positive and negative pions<sup>1,2</sup>. Previous investigations of these data have shown that the charge asymmetry parameter  $A_\pi$ , defined by :

$$A_\pi = \left[ (d\sigma/d\Omega)_{\pi^-} - (d\sigma/d\Omega)_{\pi^+} \right] / \left[ (d\sigma/d\Omega)_{\pi^-} + (d\sigma/d\Omega)_{\pi^+} \right],$$

is very sensitive to the handling of Coulomb effects<sup>3-5</sup>.

In this contribution, we present results for the asymmetry parameter according to a more sophisticated treatment of Coulomb effects.

The differential cross section for two charged hadrons can be written as :

$$(d\sigma/d\Omega)^\pm = |f_C^\pm + f_{SC}^\pm|^2, \quad (1)$$

with  $f_C^\pm$  the pure Coulomb amplitude and  $f_{SC}^\pm$  the Coulomb modified hadronic amplitude. To take into account the charge extensions of  $\pi^\pm$  and of the deuteron as well as relativistic effects on  $f_C^\pm$ , we use the Coulomb amplitude of ref. 5 :

$$f_C^\pm = f_{\text{Born}}^\pm \left[ -i\pi \ln \sin^2 \frac{\theta}{2} + 2i \sigma_0 \right] \left[ 1 - \frac{\pi}{2} \alpha v \sin \frac{\theta}{2} \exp(2i \sigma_{-1/2} - 2i \sigma_0) \right]. \quad (2)$$

The partial wave decomposed Coulomb modified hadronic amplitude is given by :

$$f_{SC, \ell \ell'}^\pm(k) = \left\{ \exp \left[ i(\delta_{C, \ell}^\pm + \delta_{C, \ell'}^\pm) \right] \right\} T_{SC, \ell \ell'}^\pm(k). \quad (3)$$

Following ref. 6, where simple prescriptions for the Coulomb corrections  $\delta_{SC, \ell}$  have been presented, we derive Coulomb corrections for the pure hadronic amplitude for all diagonal,  $\ell=\ell'$ , and nondiagonal,  $\ell \neq \ell'$ , terms of  $T_{SC, \ell \ell'}^\pm$  (ref. 7) :

$$T_{SC, \ell \ell'}^\pm(k) = T_{S, \ell \ell'}^\pm \left[ 1 + (1+k^2/2 E_\pi E_d)(\alpha_\ell^\pm + \alpha_{\ell'}^\pm)/k \right] + 0.5(\alpha_\ell^\pm + \alpha_{\ell'}^\pm) \left[ \frac{d}{dk} (T_{S, \ell \ell'}^\pm(k)) \right]. \quad (4)$$

Inelasticity and mixing parameters are implicitly included. The Coulomb factors  $\alpha_\ell^\pm$  and  $\alpha_{\ell'}^\pm$ , also take into account the modification of Coulomb corrections due to the charge extensions of  $\pi^\pm$  and of d. The pure hadronic amplitudes  $T_{S, \ell \ell'}$  come from a relativistic Faddeev three-body calculation<sup>8</sup>. For Coulomb phase shifts  $\delta_C^\pm$  we have modified the equations of ref. 5 to take into account  $\pi^\pm$  and d

charge extension as well as relativistic effects.

In figs. 1 and 2, the solid line curves show our results using all Coulomb effects mentioned above, while the dashed line curves are obtained by using  $f_{\text{Born}}^-$  and  $T_{s, \ell \ell}$  instead of eqs. (2) and (3). Data<sup>1,2</sup> have been corrected for radiative effects<sup>9</sup>.

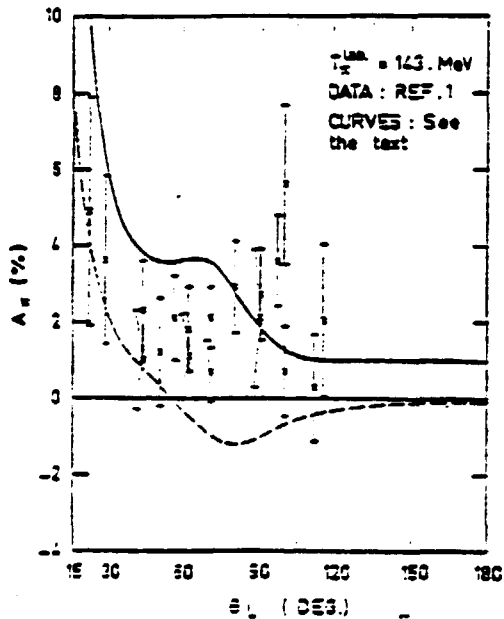


FIGURE 1

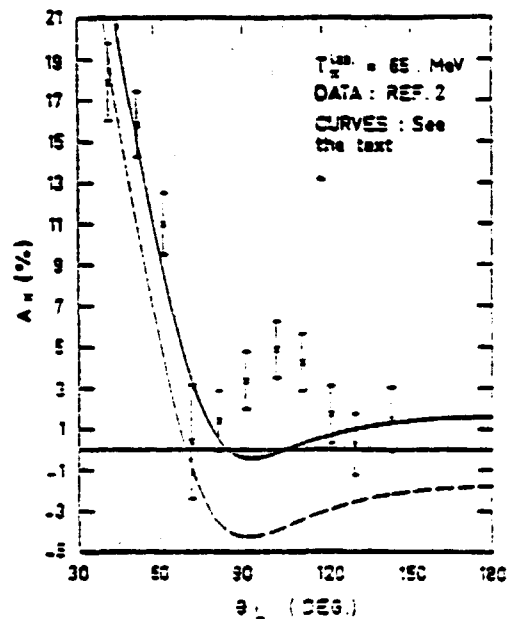


FIGURE 2

A detailed discussion of all effects contributing to the elastic  $\pi^{\pm}$ -d scattering as well as a comparison with previous investigations<sup>1-6</sup> will be reported elsewhere<sup>7</sup>.

#### REFERENCES

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