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3.14 The ppγ Reaction with Polarized Protons*

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Both the cross section and analyzing power for the proton-proton bremsstrahlung reaction, $\vec{p}+p \rightarrow p+p+\gamma$, have been measured at TRIUMF, using a polarized proton beam of 280 MeV. The two outgoing protons were detected on either side of the beam at angles between 10° and 30° to the beam, and the momentum of the one with higher energy was measured in a spectrometer consisting of a dipole magnet and four vertical drift chambers designed to accommodate high particle fluxes (fig. 1). The other proton was detected in one of five plastic scintillation counters measuring both the energy deposited and time-of-flight of the particle. Veto counters were used reduce the event trigger rate arising from elastically scattered protons. The outgoing photons were detected in sixteen lead glass Cerenkov counters located every 10° on the side of the beam opposite to the magnetic spectrometer. The target consists of 5 mm of liquid hydrogen at the centre of a 1 m long tube of cold hydrogen gas designed to remove the target windows away from the liquid hydrogen. The number of proton-proton bremsstrahlung events collected is more than an order of magnitude greater than the total number previously observed at medium energies, and backgrounds from random coincidences and from target nuclei other than hydrogen are generally less than 10%.

Two types of calculations have been carried out for this reaction at TRIUMF. One is based on the soft photon approximation (SPA) in which off-energy-shell behaviour of the amplitudes is completely determined by the on-energy-shell nucleon-nucleon phase shifts[1]. The second is a potential model type of calculation[2] utilizing particular potential models for the nucleon-nucleon interaction, such as the Reid Soft Core, the Paris, and the Bonn potential. It appears that the analyzing power at smaller proton angles is particularly sensitive (fig. 2) to the difference between these two types of calculation, in contrast to the cross section, which is rather insensitive. It is hoped that by the time of the symposium, preliminary results of the analyzing power measurements should be available to compare to these calculations.

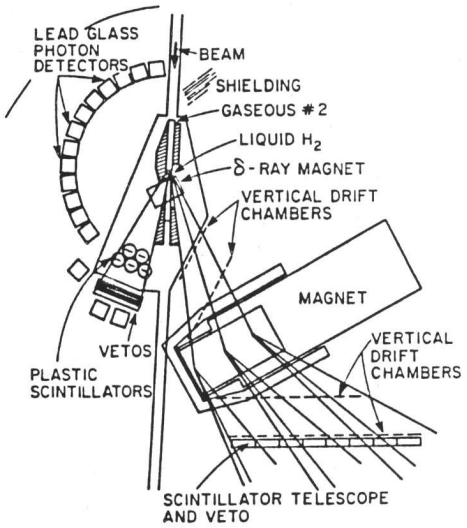

Fig. 1

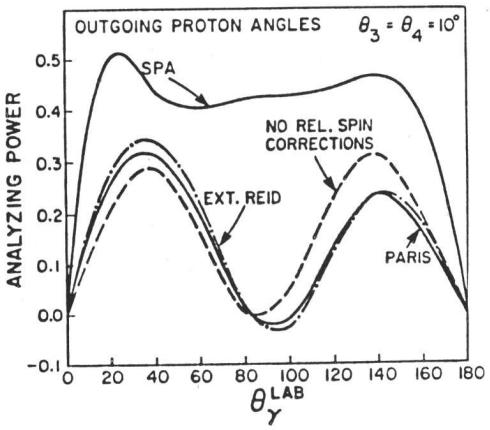

Fig. 2

References

1. H. Fearing, Phys. Rev. D 7 243 (1973). Phys. Rev. C22 1388 (1980).
2. R. Workman and H. Fearing, to be published