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ЛАБОРАТОРИЯ ЯДЕРНЫХ ПРОБЛЕМ

RADIATION-RESISTANT FILM TARGET

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At JINR there has been developed a method for measuring the cross sections of elastic high energy particle collisions with an extremely small momentum transfer on the measurement of recoil particle yield from a hydrogeneous (or deutrious) target placed directly in the accelerator chamber. The method has been successfully applied for studying high energy proton scattering on protons and deuterons /1-3/. Polyethelene film about 3 microns thick was used as a target. Recoil particles could emerge from it with multiple scattering permissible for experiment. The film was fastened with the help of quartz threads 7 microns thick.

Comparatively short service term is a serious problem of film target employment. Under the effect of the intensive particle flux the film darkens and then is destroyed. The destruction occurs due the radiation damage or local overheating.

In vacuum, where the film is cooled poorly, the latter effect predominates. Approximately in two hours of operation with the proton beam of intensity required for experiment the film is destroyed.

The problem of film service-term became still more complicated when an experiment analogous in method was performed at the

Erevan electron accelerator. The matter is that the reaction is two or three orders of magnitude lower with an electron beam than with a proton one. It is necessary to increase the beam intensity approximately in the same way to obtain the normal rate of statistics acquision. In order to increase the service term of the target we manufactured a target of such a design with which the irradiated spot is varied constantly. The target is schematically shown in Fig. 1. A disc-shaped film is fastened in the central part to a metalic disc which is located at the motor axis and is rotating. Under the effect of centrifugal forces the film protruding outside the metallic disc is straightened and turns out to be in the rotating plane. The particle beam goes to the film from outside in the direction to the disc center. The peculiarity of this target is that it has no frames or some other film holders except a simple metallic disc located in the region outside the particle beam reach. The rotation provides the constant variation of the irradiated spot and this considerably increases the target service term. In the concrete version use was made of polyethelene film 3 microns thick and 140 mm in diameter. The diameter and the thickness of the metallic disc were 80 mm and 1 mm, respectively. The motor rotation speed was unsecure when the electron beam had passed through it with the mean intensity of 200 μA during 50-70 hours.

In conclusion the authors wish to thank S.L. Smirnova for preparing thin polyethelene films as well as G.B. Badalian and his colleagues for the joint experiment with the above-described target.

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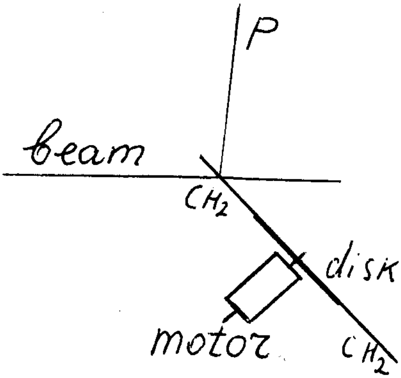

Fig. 1.