A simple "camera" for high energy beams

Michael J. Longo and Orman E. Haas

Randall Laboratory of Physics, University of Michigan, Ann Arbor, Michigan 48104
(Received 2 November 1973; and in final form, 15 November 1973)

By incorporating an x-ray intensifying screen into a standard 10×12.7 cm Polaroid film back, we have been able to reduce the exposure time required to obtain a beam profile drastically. The modified film backs have been used very successfully in high-energy neutron and charged particle beams.

For several years our group has used a standard 10×12.7 cm Polaroid film back fitted with an x-ray intensifying screen to obtain profiles of beams of high-energy neutrons and charged particles. With typical high-energy beam intensities exposure times are ~5 min, compared to ~5 h without the intensifying screen. The modified Polaroid film back is shown in Fig. 1. The intensifying screen is mounted on a plate which is spring loaded to maintain a slight pressure on the film. The plate is attached to a cover which is screwed to the front of the film holder to make a light tight assembly. The film holder is used just as it would be on a camera.

We have used standard x-ray intensifying screens such as the DuPont Hi-Plus. This gives an intensification of about 50. Faster screens are available with some loss of resolution. To protect the screen from being scratched by the metal clip on the Polaroid film, the screen is covered by a thin sheet of Mylar. A grid or other identification can be put on the Mylar or the intensifying screen to provide reference marks on the exposed film. These can be aligned relative to marks on the outside of the film holder, which in turn provide an external reference. For use in neutron beams the pressure plate can be made fairly thick to act as a converter. With a brass converter approximately 2.5 mm thick in a high-energy neutron beam, it takes an exposure ~10^6 neutrons/mm^2 to produce a detectable image with ASA 3000 film.

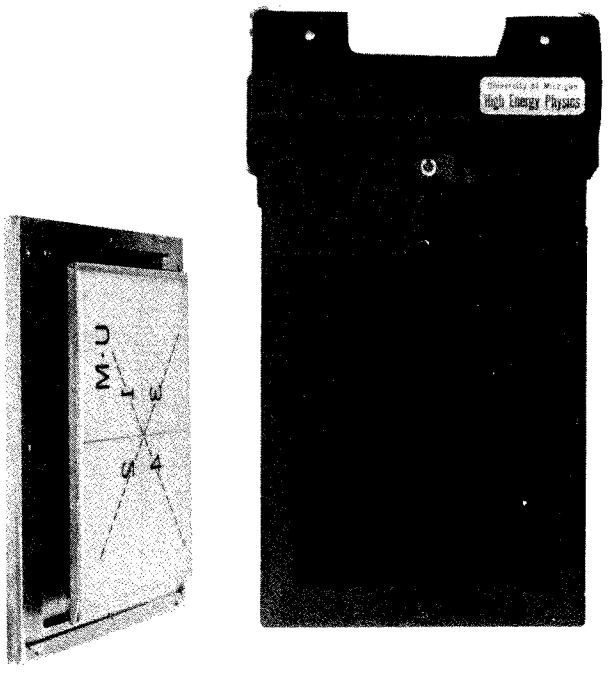

FIG. 1. The Polaroid film back and cover with the pressure plate and intensifying screen. Except for the mounting holes, the film back is unmodified. This film was made for use in neutron beams (~10 GeV) and the thick pressure plate serves as a converter.

