three times its average value in the deuteron. It seems possible that the backward peak would be reduced by the inclusion of tensor forces.[4]

* Assisted in part by the AEC.

[1] G. F. Chew, Phys. Rev. **74**, 809 (1948); R. L. Gluckstern and H. A. Bethe, Phys. Rev. **81**, 761 (1951).

[2] This approximation was checked by calculating the exact and approximate expressions using a Yukawa well and various energies and angles in the range of interest. At 90 Mev the agreement was everywhere within 10 percent; for large angles with higher energies the agreement is rather worse but since the exchange parts of U and L are dominant only for intermediate angles the approximation is satisfactory. We wish to thank Mr. T. A. Auerbach for making available to us his numerical evaluations for the exact integrals.

[3] M. O. Stern, University of California Radiation Laboratory Report No. 1440 (1951) (95-Mev data); Cassels, Stafford, and Pickavance, Nature **168**, 556 (1951) (146-Mev data); R. D. Schamberger, Phys. Rev. **83**, 1276 (1951) (240-Mev data).

[4] Horie, Tamura, and Yoshida, Prog. Theoret. Phys. **6**, 623 (1951).

Some Polystyrene Solid Solutions as Scintillation Counters*

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THE scintillation efficiency and the spectral emission of a number of polystyrene solid solutions have been investigated. The method of preparing the solid solutions and the experimental procedure used in obtaining the data is similar to what has been reported previously.[1] A 5819 photomultiplier tube was used for the counting experiments. Co^{60} was used as a γ-ray source. A commercial x-ray machine was used as a source for the emission-spectra studies. The solid solutions compared were plastic disks containing 2 percent by weight of the phosphor in styrene, which were then polymerized by a 50-50 benzoyl peroxide-tricresyl phosphate catalyst. The results are summarized in Fig. 1 which gives the relative counting rates as a function of discriminator bias and in Table I where the peaks of the emission bands are recorded. It is interesting to compare these results with those obtained with the single crystals of the corresponding phosphors.[2] It will be noted that the relative order is not always the same. A notable exception is diphenylacetylene. In the crystalline state this material compares favorably with stilbene whereas in the solid solution its performance is much poorer. Since the emission bands of the solid solution and of the crystal are located in approximately the same spectral region, a poorer counting rate cannot be ascribed to a shifting away from the region of more favorable spectral response of the 5819 photomultiplier tube.

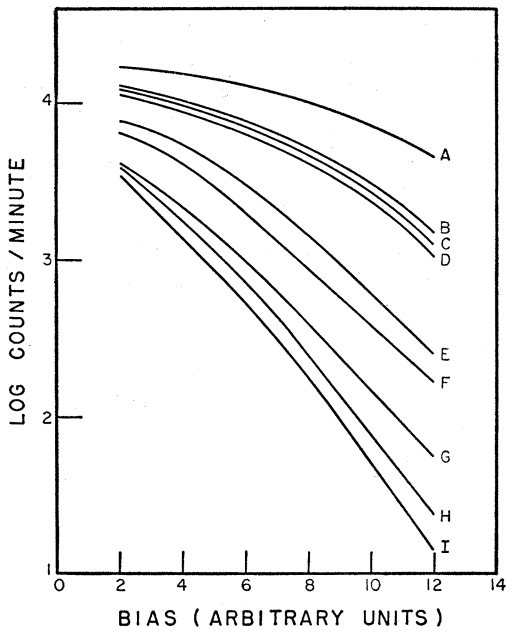

FIG. 1. Discriminator curves for some phosphor-plastic combinations: *A*—terphenyl; *B*—diphenylbutadiene; *C*—anthracene, *D*—stilbene; *E*—diphenyldiacetylene; *F*—biphenyl; *G*—diphenylacetylene; *H*—diphenylethane; *I*—polystyrene (plain).

TABLE I. Wavelengths of emission bands of various 2 percent phosphor-plastic systems excited by x-rays.

Material	Wavelength (A)
stilbene	3760, 3600
diphenylbutadiene	4040
diphenylhexatriene	4200
diphenylacetylene	3720
diphenyldiacetylene	4610
anthracene	4475, 4235
diphenylethane	~3200
terphenyl	3620, 3480

Polystyrene-diphenylhexatriene solid solutions gave poor performances as counters. The large spectral shift toward the blue (1000A), plus the fact that there was a considerable amount of difficulty in realizing the polymerization of the solution, indicated that there probably was a chemical reaction between phosphor and catalyst or styrene with an interruption to the conjugation of the polyene chain. The corresponding system with diphenyloctatetraene failed to polymerize satisfactorily even after prolonged heating so it is not included in these results.

We wish to acknowledge our indebtedness to Professor J. D. H. Donnay and Professor R. Maddin for the use of their x-ray machines.

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[2] W. S. Koski and C. O. Thomas, J. Chem. Phys. **19**, 1286 (1951).

Absence of Secondary Maxima in the Transition Curve for Electronic Showers

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IN a recent letter Tsai-Chü[1] tentatively explained the existence of a secondary maximum of the Rossi curve obtained by a counter arrangement very similar to that of Bothe and Thurin.[2]

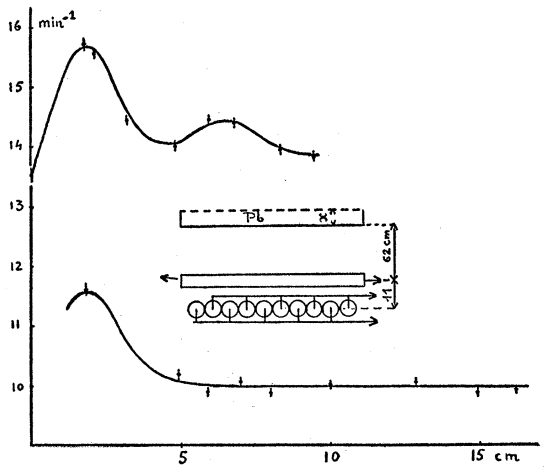

FIG. 1. Rossi curves for lead.