escape of the annihilation radiation; the intermediate peak is due to escape of only one annihilation photon. The continuum of Compton electrons of lower energy than these peaks has riding on it a number of other peaks. The weak peak at 2.24±0.04 Mev seems to be a photoelectric peak due to the capture gamma-ray of hydrogen in the paraffin. The peak at 0.83 Mev is that produced by the nuclear gamma-ray of polonium, while the peak at 0.52 Mev is that due to the excited state of Li^7 at 0.478 Mev. This radiation is produced by neutron capture in the boron shield.

Figure 2 shows the high energy section of the spectrum from 4.4 to 8.4 Mev. Integral counting shows that there is no significant number of pulses above this energy. The upper branch of this curve having a peak at about 6.4 Mev (gamma-ray energy 7.4 Mev) was obtained when a portion of the boron shield was

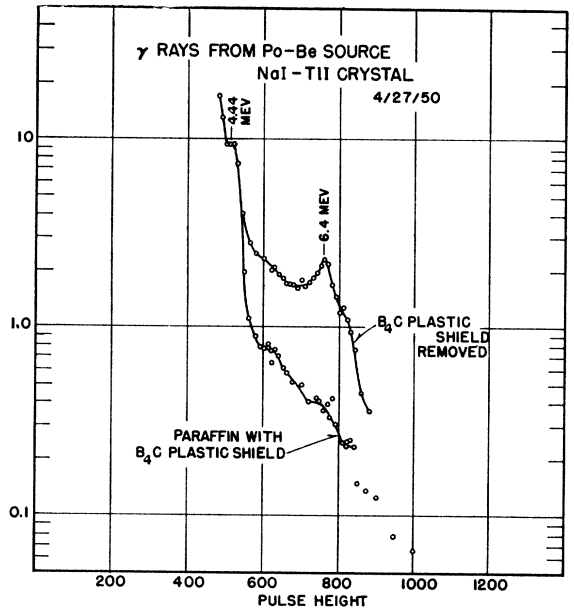

FIG. 2. Pulse distribution produced by a Po—Be neutron source between 4 and 8 Mev.

removed allowing the neutrons to strike the iron magnetic shield of the photo-multiplier. The small bulge in the shielded curve at about this same energy may well be due to neutrons escaping the paraffin and boron and reaching the iron.

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Variation of the Decay Time of the Fluorescence of Anthracene and Stilbene with Temperature

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SINCE many of the early discrepancies of fluorescence decay time measurements of scintillating crystals were resolved when the phosphor temperature was taken into account, it became of interest to investigate the fluorescence decay time for a given phosphor over a wide range of temperatures. Kelley and Goodrich[1] published measurements of the decay time of anthracene in the temperature range 78 to 308°K; they found a linear variation of the decay time in this temperature range and extrapolated their linear curve finding a zero time intercept at 0°K. A report of preliminary data from this laboratory[2] gave the results of measurements of the decay time of anthracene at 290, 80, and 4°K; these

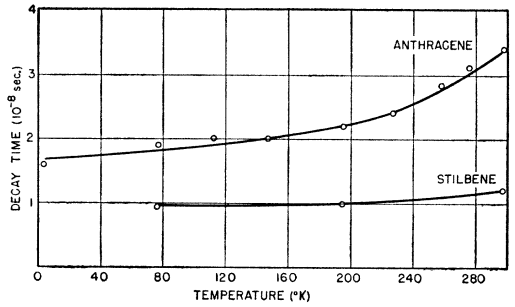

FIG. 1. Variation of the decay time of fluorescence with temperature.

results were in substantial agreement with those of Kelley and Goodrich at the two higher temperatures.

In order to extend the knowledge of the variation of the fluorescence decay time with temperature, a series of measurements have been made on an anthracene single crystal in the temperature range 4 to 298°K and on a stilbene single crystal in the range 78 to 298°K. The phosphor was mounted on the end of a quartz bar eight inches from the photo-cathode of a 931-A photo-multiplier; the phosphor was placed in the desired temperature bath while the photo-multiplier was operated at room temperature. A 10-μC Ra source was used for excitation, and the output of photo-multiplier was fed into a shorted coaxial line apparatus[3] to measure the decay time.

The results of these measurements are shown in Fig. 1, and they indicate within the limits of experimental error (±10 percent) that the decay time approaches a constant value at low temperatures. In the case of stilbene, measurements taken at widely spaced temperature points show its decay time to be almost a constant from dry ice temperature to room temperature. It should be noticed that variation of the stilbene light output with temperature is also approximately constant.[4] A suitable explanation for the variation of apparent time of decay with temperature can be made in terms of additional metastable states in the crystal. However, without further spectroscopic information such conclusions may not be warranted.

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The Low Energy Neutron Spectrum from $Li^7(d,n)Be^8$

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THE neutron spectrum from the $Li^7(d,n)Be^8$ reaction has been investigated by several observers, but the presence of the Li^6 isotope made it infeasible to interpret the low energy portion of the spectrum unambiguously. Staub and Stevens[1] observed the spectra in a cloud chamber using both recoil protons and recoil α-particles to determine the energy of the neutrons. With both gases they found a plateau which they attributed to the continuous distribution of neutrons from $Li^7+d\rightarrow He^4+He^5$, $He^5\rightarrow He^4+n$, and an increase in intensity at about 1.5 Mev, but with the helium they also observed a group at 5.5 Mev which was not present in the proton spectra. Richards[2] made the first investigation of the spectra using photographic plates but he used such large energy intervals that the resolution was poor in the low energy region. Green and Gibson[3] have investigated carefully the high energy portion of the spectra at several angles using photographic plates and have determined the shape of several of the groups more accurately than did previous investigators.