mass as a function of θ, the angle in the center of mass:

$$(d\sigma/d\Omega)_{cm}=(3.20\pm0.78)(0.071\pm0.068+\cos^2\theta)$$
$$\times10^{-29}\ \text{cm}^2\ \text{sterad}^{-1}.$$

The total cross section for the mesons in the peak is therefore $(1.62\pm0.49)\times10^{-28}$ cm^2. This suggests that the meson comes off almost entirely in a P-wave, and since the majority of the mesons of the entire spectrum are in the peak, it would follow that the total spectrum is approximately in a P-wave.

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The Radioactivity of Barium 140

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RADIOACTIVE barium of half-life about 13 days was first noted[1] as a product of the bombardment of uranium by neutrons, even before the phenomenon of nuclear fission was recognized. Subsequent studies[2] have shown the activity to be in Ba^{140}, in which the beta-decay to La^{140} is complex and accompanied by gamma-emission. Three gamma-rays had been reported[3] with energies of 0.16, 0.30, and 0.54 Mev.

TABLE I. Summary of electron lines.

Electron energy (kev)	Relative intensity	Interpretation	Gamma-energy (kev)
23.3	20	$L_1^1(Z=57)$	29.6
23.7	2	L_2^1	29.6
24.1	1	L_3^1	29.6
28.2	10	M^1	29.6
29.3	5	N^1	29.6
79.8	1	K^2	118.5
93.1	4	K^3	131.8
123.3	10	K^4	162.0
156.0	5	L^4	162.3
160.8	2	M^4	162.2
265.5	4	K^5	304.2
382.8	1	K^6	421.5
397.1	1	K^7	435.8
498.0	4	K^8	536.7
530.0	1	L^8	536.3

A continued study of the fission product as supplied by the Oak Ridge National Laboratory, using photographic magnetic spectrometers, leads to a more accurate evaluation of energies and shows the existence of certain previously unreported gamma-rays. The barium radioactivity will usually be in equilibrium with the daughter, radioactive lanthanum. It appears, however, that in the original chemical separation of Ba^{140}, the La^{140} is carried down in excess of the equilibrium amount. This leads to a change in the relative intensity with time of the electron lines due to La^{140} as compared with the electron lines due to Ba^{140} and thus aids in their identification. The half-life curve of the specimen is complex, showing an initial 41-hour decay before settling into the longer barium half-life, now found to be 13.4 days. The K-L-M differences of the electron energies also make it possible, in most cases, to distinguish those electron lines associated with each activity.

A summary of the electron energies (believed to be accurate to ±0.2 percent) together with an arbitrary estimate of their relative intensities, and proposed gamma-origin is presented in Table I. A

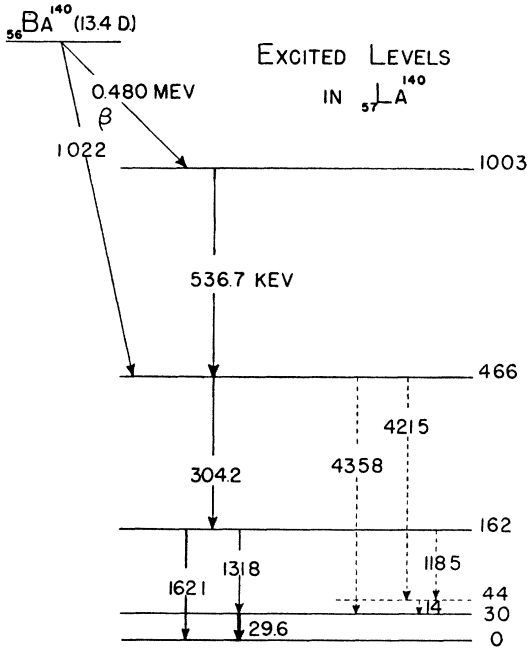

FIG. 1. Energy levels in La^{140} following beta-emission from Ba^{140}.

decay scheme had been proposed by Beach *et al.*, using their three observed gamma-energies, in which an unobserved gamma of 76 kev would have been required. It is now quite certain this gamma-ray does not exist. The observed gamma-energies do, however, fit very satisfactorily a modification and enlargement of the level scheme as shown in Fig. 1. The gamma-rays of greater intensity are represented as transitions with darker lines. The transitions shown as dotted lines are less certain, since only the "K" electron line was observed for each of these gamma-rays and there is some possibility that any or all of this activity is in the daughter product. In order to complete the scheme a gamma-ray of energy 14 kev would be required. This energy is slightly below the limit of the spectrometers.

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Gamma-Radiation from Lanthanum 140

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A PREVIOUS study of the radioactivity from La^{140} (41.4 hr) showed[1] the presence of twelve low energy gamma-rays, with an indication of others at higher energy. A contemporary report noted[2] the beta-decay of La^{140} to be complex with energies of 1.32, 1.67, and 2.26 Mev; but only five gamma-rays, mainly at higher energy, were found. The present spectrometric investigation,