the spectrum turns out to be

$$p\beta c = 180 \text{ Mev} \quad \text{for} \quad M_K = 940,$$
$$p\beta c = 200 \text{ Mev} \quad \text{for} \quad M_K = 1000.$$

Agreement with the experimental results is still possible, though somewhat more difficult.

Hence the main argument against the hypothesis of a unique K meson arises from the observations mentioned above of the Bristol group.

One may note that any decay scheme involving a neutral particle heavier than π^0, such as V_2^0, is excluded on account of the small value of the mass of the parent particle.

To sum up, the great majority of K particles observed until now in photographic emulsions can be interpreted as due to the decay of a particle of 940 ± 40 electron masses into at least three particles, one of which is a μ; the upper limit of the energy spectrum of the μ is about $p\beta c = 200$ Mev; among the neutral products, at most one could be a π^0, and none could be heavier than a π^0. We suggest the name "kappa" (first introduced by O'Ceallaigh and the Bristol group[11]) to designate the parent particle.

[1] The term K meson is used to designate any unstable particle of unit charge which has a mass lying between those of π-meson and proton and emits a charged secondary particle at the end of its range. K_B, K_M, K_O, K_P = observations from Bristol, Milano, Oslo, Paris.
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Energy Levels of C^{12} from the $Be^9(\alpha,n)C^{12}$ Reaction

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ENERGY levels of C^{12} have been studied by examining the gamma-radiation from the reaction $Be^9(\alpha,n)C^{12}$. The α-particles were emitted from a thin polonium source (strength 80 mC) deposited on a 1-cm square of thin platinum foil. The foil was placed adjacent to a 1-cm square of beryllium foil (33 mg/cm²) and the whole enclosed in an evacuated copper box with sides 1 mm thick. The gamma-radiation was analyzed with a pair spectrometer similar to that described by Johansson[1] and the spectrum displayed on a 25-channel kicksorter.

Apart from the well-known energy level of C^{12} at 4.43 ± 0.05 Mev (the mean value of a number of observations)[2–6] with $J=2^+$, the existence of a level at 7.5 Mev is indicated by the neutron spectrum from this reaction,[7] and also by the discovery of pair emission [energy (7.0 ± 0.6) Mev] from this reaction.[8] This evidence, together with the absence of gamma-radiation of 7.5 Mev from such an excited level to the ground state of C^{12} ($J=0$), suggested that its spin is also zero. It is to be expected that the de-excitation of this level could also take place by a gamma-cascade via the 4.43-Mev level, resulting in the emission of a gamma-ray of energy about 3 Mev. Previous measurements do not exclude the existence of such a line and place an upper limit of 30 percent on its intensity.[9] (All intensities refer to the 4.43-Mev line as 100 percent.)

We have detected gamma-radiation of energy 3.16 ± 0.05 Mev and intensity $\sim$3 percent in addition to the 4.43-Mev line (see Fig. 1). Together with the evidence obtained from internal pairs,[8] this suggests the existence in C^{12} of a level with energy 7.59 ± 0.07 Mev rather than a level at 3.16 Mev. To show that this radiation was not due to secondary effects caused by neutrons from the reaction (i.e., interaction of the neutrons with the copper of the source box or with the sodium and iodine nuclei of the central crystal of the spectrometer) the following two tests were made. First a run was made with $\frac{1}{2}$ cm of extra copper surrounding the source box. The intensity of the line was not enhanced, thus eliminating the first possibility. Again if the radiation is due to secondary effects in the central crystal, then

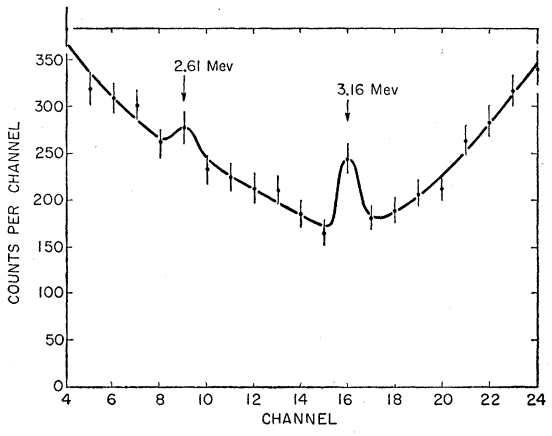

FIG. 1. 3.16-Mev line from $Be^9(\alpha,n)C^{12}$.

intensity (relative to the 4.43-Mev line) would vary as the linear dimensions of the crystal. Measurements made of the intensity with two crystals of different sizes (1 in. cube and 1.5 cm×1 cm ×1 cm) definitely exclude this possibility.

A very weak gamma-ray of energy 2.61 ± 0.08 Mev and intensity $\sim$1.5 percent was also detected but on repeating the copper test its intensity increased to $\sim$7 percent. This line was therefore attributed to interaction of the neutrons with copper (probably inelastic scattering).

We have also examined the region in the neighborhood of 7.5 Mev but no evidence was found for radiation of this energy (upper limit of intensity 1 part in 2500). Previous measurements have placed an upper limit of 1 part in 500.[5]

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Proton-Proton Scattering at 32.0 Mev

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CALCULATIONS have been made[1] of the differential cross section for proton-proton scattering at 18.3 and 32 Mev. The pseudoscalar meson theory was analyzed and comparison was made with the 18.3-Mev data[2] and the 32-Mev data.[3–4]

The purpose of this letter is to point out that later data have been published[5] supplementing the earlier data.[3] These data are plotted in Fig. 1 transformed to 32.0 Mev assuming a $1/E$ de-