On the Interaction of Elementary Particles. IV.

By Hideki Yukawa, Shoichi Sakata
and Minoru Kobayashi

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§1. Introduction and Summary

In the previous papers[1], it was shown that the introduction of the neutral Bose particles, which were named N-particles by Bhabha[2], in addition to the charged Bose particles, i.e. U-particles, was necessary in order to account for approximate equality of unlike particle and like particle forces[3][4]. In this paper, we want to deal with this problem by assuming the wave equations for the N-particles, which have the same form as those for the U-particles. We can assume, further, that the interaction between the heavy particle with the former has the same form as that with the latter, except that the factor $a+b\tau_3$ of the form $a+b\tau_3$ appears in place of $\tau_1+i\tau_2$ or $\tau_1-i\tau_2$, where a, b or $a+b$ are arbitrary complex numbers. (1a) Thus, the forces between like particles as well as the ordinary forces between unlike particles can be obtained in a manner the similar to usual way. (1b) The arbitrary constants a, b can be determined by comparing the forces thus obtained with those employed in Fermi's theory. By choosing the constants a, b suitably, we arrive at the forces thus obtained can take the exactly same form as obtained from the forces assumed in the current theory. Very recently, Kemmer considered this problem in detail as investigated shown by Kemmer recently.[3] (1c)

As already shown in mentioned in detail in II, §7, the forces between thus obtained are not strictly central, so that we have to consider

1) Yukawa, Proc. Phys.-Math. Soc. 17, 48, 1935; Yukawa and Sakata, ibid. 19, 1084, 1937; Yukawa, Sakata and Taketani, ibid. 20, 319, 1938. They will be refered to as I, II and III.

b) Kemmer. The authors wish to express their thanks to Dr. Kemmer for sending the manuscript of his paper before to be published in Proc. Camb. Phil. Soc.