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On the Theory of Elementary Particles. II.†

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§ 1. Introduction

In the previous paper¹⁾, the author attempted to generalize the present field theory by discarding the restriction that the field quantities are localized, according to Dirac's nomenclature²⁾, in ordinary space-time.

Thus the electromagnetic field, which interacts with the electron, for instance, can be described by a four-vector operator A_ν ($\nu =$ ^{electrodynamics} in ordinary field theory) corresponding to the four-potential. As shown in §. I, we have a set of commutation relations

* On leave from Kyoto University (will be referred

1) Yukawa, Prog. Theor. Phys. 2 (1947) which

2) Dirac, Phys. Rev. 73 (1948) to as I.

† Contents of the first half of this paper were already reported in a short note.

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the relations $[p_\mu, A_\nu] = 0$; (1)

which corresponds to Maxwell's field equations in ordinary theory.

Now the four vector is not only on operators A_ν depend time and space coordinates x_μ , but also on energy-momentum coordinates p_μ , the equations

(1)

where

$$[A, B] \equiv AB - BA$$

for any two operators A, B .

(2)