48-4

Physics Department,
Kyoto University,
Kyoto, Japan,
Feb. 21, 1948.

Dear Prof. Oppenheimer:

As it is not certain whether my previous letter sent by air mail last Nov. has already reached to you or not, again I express my thanks and personal acceptance for your kind invitation. Although I am not sure as to the time when the approval of the occupation authorities will be obtained, I hope I shall be able to see you in Princeton in this year. Recently I heard from Dr. Watanabe, who is a best friend of mine and an able theoretical physicist, that Mrs. Watanabe had visited you and was very thankful for your kindness. He is also wanting to go to U. S. and study in Princeton.

We were very much interested in the paper by you and Dr. Bethe on the reaction of radiation on electron scattering in relation to Heitler's theory of radiation damping. Very recently, it was informed tome by Sebe of Kyushu University that, if we started from the distorted wave functions

$$\Psi(\vec{p}) = \varphi(\vec{p})/\sqrt{1+R}\left\{\Psi(0) - \int^{q^*_{max}} C q^{-\frac{3}{2}} \vec{p}\vec{q}\,\Psi(\vec{q})\,d\vec{q}\right\},$$

$$\Psi(\vec{p},\vec{q}) = \varphi(\vec{p})\left\{C q^{-\frac{3}{2}} \vec{p}\vec{q}\,\Psi(0) + \Psi(\vec{q})\right\},$$

$$R = \frac{2}{3\pi}\frac{e^2}{\hbar c}\left(\frac{v}{c}\right)^2 \int_q^{q^*_{max}} dq/q,$$

the cross-section for radiationless scattering became

$$d\sigma = \lambda^2 dw \frac{W^2}{1+W^2} - 2\lambda^2 R(1-\cos\alpha)\frac{W^2}{1+W^2},$$

the second term of which was exactly compensated by radiative scattering

$$d\sigma_r = 2\lambda^2 R(1-\cos\alpha)\frac{W^2}{1+W^2}$$

in the region of low frequencies. I do not yet know the details of his calculation, but I beleive that his result may bring about your interest.

Remarkable results obtianed by further investigations of Occhialini and others as published in Nature, Oct. issue, seem to confirm the idea suggested in your previous letter that ordinary cosmic ray mesons are decay products of heavier mesons, which are probably responsible for the nuclear force, although there remains still the ambiguity as to the choice of spins for two sorts of mesons. In this connection, recent photograph obtained by Anderson indicating a new type of meson decay is very interesting, but we feel it a little difficult to find consistent interpretation, if we take into account the decay photograph obtain by Williams and Roberts in 1940. One possibility is that the meson in Anderson's photograph is a μ-meson with spin 1/2 decaying into an electron, a neutrino and a neutral μ-meson, whereas that in William's photograph is a π-meson with spin 0 decaying into an electron and a neutrino instead of decaying into charged and neutral μ-mesons, although the latter process is more usual. We want to know your opinion as to the nature of the meson and related problems.

I would be very much obliged, if you will kindly send reprints of your recent papers, which can now be directly adressed to me. Please give my best regards to members of your institute.

Yours very sincerely,

H. Yukawa

Hideki Yukawa.