first one in the case $T \gg \omega_0 = \omega(\varkappa)$. If on the contrary $T \ll \omega_0$, the second factor in eq. (16) becomes -1, the same as in the gap equation of the previous section. Then the interaction acquires the same form as a pure Coulomb (40) with the replacement $4\pi e^2/\varepsilon_\infty \to -g\varkappa^2$. The sign is of no importance, since only the square of the interaction enters the scattering probability, and the order of magnitude of both interactions is likely to be the same. Therefore we will write the interaction in the form (40) with the possible replacement $4\pi e^2/\varepsilon_\infty \to -g\varkappa^2$ in case $T \ll \omega_0$. We obtain

$$\frac{1}{\tau_{ee}} = 2\pi\left(\frac{4\pi e^2}{\varepsilon_\infty}\right)^2$$

$$\times \int \frac{n_2(1-n_1')(1-n_2')\delta(\varepsilon_1+\varepsilon_2-\varepsilon_1'-\varepsilon_2')(1-\cos\theta)}{[(p_1-p_1')^2+\varkappa^2]^2}\frac{d^3p_1' d^3p_2}{(2\pi)^6}, \tag{42}$$

where θ is the angle between the velocities before and after scattering, and n_i are the Fermi functions. Integrating we obtain the final expression.

$$\frac{1}{\tau_{ee}} = \frac{1}{2\pi}\frac{e^4 P_{y0}}{\varepsilon_\infty^2 d}\frac{m_x}{\varkappa^2}\frac{T}{\mu-\varepsilon_0} = \frac{1}{4\sqrt{2}\,N_s}\frac{e^2 m_x^{1/2}}{\varepsilon_\infty(\mu-\varepsilon_0)^{1/2}}T \tag{43}$$

(here we have substituted the formula (17) for $\varkappa^2$).

The reason why we get in this case a linear T dependence instead of the usual quadratic one is that in a 3D or 2D dimensional case the δ-function fixes the angle between the momenta whereas in the 1D situation there is no angle to fix, and the δ-function reduces two momentum integrations to one. The coefficient in the linear dependence (43) would be large ($e^2/v_F \sim 1$ for an ordinary metal, and here v_F is much smaller) if not for $\varepsilon_\infty \gg 1$. Therefore this requirement is actually the condition for the Landau Fermi-liquid theory to be applicable to the layered cuprates under consideration.

Now we calculate the scattering probability from phonons; it is given by the expression

$$\frac{1}{\tau_{ep}} = 2\pi g \int \frac{\varkappa^{2n}\omega(k)\,\delta[\varepsilon(p)-\varepsilon(p-k)]\,(1-\cos\theta)\,d^3k/(2\pi)^3}{(k^2+\varkappa^2)^n\{\exp[\omega(k)/T]-1\}}. \tag{44}$$