where M is the average ion mass (in the high-T_c copper oxides O_{16} is usually partially substituted by O_{18}). Hence the power α can be defined by the relation

$$\alpha = \frac{\partial \ln T_c}{\partial \ln M} \quad . \tag{26}$$

The dependence of type (25) is definitely true in the simplest electron-phonon interaction model, where $\alpha = 1/2$, but in most of the real cases the connection is far more complicated. Since, however, the relative variation of the ion mass is very small, formula (26) can be taken as a rather complete characteristic of the isotope effect even in cases, when the original formula (25) is not correct, and the true dependence is far from a power law.

There exists an observation that in cases, when the composition of a layered cuprate superconductor can be altered in a regular way, and the critical temperature varies with concentration, the isotope effect depends on composition, and the lower the critical temperature, the larger is α. The known examples are $(Y_{1-x}Pr_x)Ba_2Cu_3O_{7-\delta}$ with varying x [19], [20], $YBa_2(Cu_{1-x}Zn_x)_3O_{7-\delta}$ [21], $Y(Ba_{2-x}La_x)Cu_3O_7$ [22] and $(La_{2-x}Sr_x)CuO_4$ as well as $(La_{2-x}Ba_x)CuO_4$ [23], where in fact a nonmonotonous dependence α(x) was observed.

The small value of α of the order of 0.019±.005 for $YBa_2Cu_3O_7$ [24] has lead (and still does) to conclusions about the non-phonon mechanism of electron interaction, although it was mentioned rather early by J.Labbe and J.Bok [13] that a *simple* saddle point in the electron spectrum enhancing superconductivity due to an increased density of states in some region close to the Fermi level, can replace the Debye frequency as a cut-off of the interaction, by some electronic energy limit independent on the ion mass. Such an idea applies even better to the *extended* saddle point since the singularity in the density of states is much stronger.

In the framework of the E-L model the momentum region of the singularity in case of small angle scattering is singled out in the sense of definition of the order parameter: all the necessary information belongs only to this region. On the contrary, the order parameter in other regions is defined by its value in the singular region: it is finite until it does not vanish in the singular region. This means that the critical temperature is also defined only by the singular region, and hence we can consider only this region and not bother about the rest. In the case of an extended saddle point singularity the integral in the BCS self-consistency equation is convergent, and the corresponding energy scale is equal to

$$\mu_1 = \mu - \varepsilon_0 \ , \tag{27}$$

i.e. the Fermi energy calculated from the saddle point. This energy does not depend on the ion mass. It can happen, however, that μ_1 exceeds some ω_0 which is the true interaction cut-off. In this case ω_0 becomes the integration limit despite the convergence of the integral, and hence the order parameter and the critical temperature will start to depend on the ion mass. This all happens gradually and for practical purposes it can be represented as