## II. NEGATIVE MAGNETORESISTANCE IN 3D CASE.

Let us consider negative magnetoresistance in 3D case. As it was mentioned above, an important ingredient to be included with respect to the previous studies is a random potential imposed by the intermediate charged centers (including both donors and acceptors).

We shall start from a solution of a Schrodinger equation

$$-\frac{\hbar^2}{2m}\Delta\Psi + U_0(\mathbf{r})\Psi + U(\mathbf{r})\Psi = E\Psi. \tag{1}$$

Here $U_0(\mathbf{r})$ is the potential of impurity ($U_0 = -\alpha/r$ in the case of hydrogen-like impurity level) and $U(\mathbf{r})$ is random potential that comes from the charged centers mentioned above, $m$ is the electron mass in the conduction band (or a hole mass in valence band) and $E$ is exact electron energy (we consider $|E| \gg U(\mathbf{r})$).

Because of the fact that typical hopping lengths are much larger then characteristic localization length $a$, we can solve (1) at $r \gg a$. Moreover, the typical hopping length $r_h$ appears to be much larger than typical distance between charged centers which can be roughly estimated as $n^{-1/3}$ where $n$ is a dopant concentration. Indeed, for 3D variable range hopping of the Mott type

$$r_h = \xi a, \qquad \xi = \left(\frac{T_0}{T}\right)^{1/4}, \tag{2}$$

where

$$T_0 \simeq \frac{21}{ga^3}, \tag{3}$$

where $g \sim n/\mathcal{E}_B$ is the density of states, $\mathcal{E}_B$ being Bohr energy. Thus one obtains

$$r_h n^{1/3} \sim \left(\frac{21 a n^{1/3}\mathcal{E}_B}{T}\right)^{1/4} \tag{4}$$

that is even for the Mott law $r_h n^{1/3} >> 1$. The more so it holds for the Coulomb gap regime where $r_h$ strongly exceeds the corresponding values for the Mott regime.

Thus we are interested in asymptotics of the wave functions at distances much larger than $n^{1/3}$ which for moderately compensated material can be considered as the correlation length of the random potential imposed by the charged centers. If so, we can make an important conclusion. Namely, the random potential $U$ is formed by the long-range Coulomb centers and in this sense the potential produced by the "parent" (for the considered wave function) impurity at distances larger than $n^{-1/3}$ makes no difference with respect to potential produced by other charged centers. In other words, for $r > n^{-1/3}$ one should not discriminate