The K-T transition temperature T_c obtained in our calculations as a function of the exciton density n in a single quantum well is given by Eq. (4). It is shown that T_c increases when the exciton density n increases. Besides, at the fixed temperature the superfluidity in a single quantum well exists at the exciton densities greater than the critical one. This critical exciton density increases when the temperature increases. The theoretical results also show that a superfluid transition at $T_c = 2$ K requires an exciton density of 7.5×10^{10} cm^{-2}; which is reasonably close to the theoretical estimate of the exciton density realized in the experiment of Ref. [13].

Besides, we investigate dipole excitons with spatially separated electrons and holes in CQWs when the number of electrons in the electron well is much more than the number of holes in the hole well. In a dilute system when the numbers of electrons and holes are equal, ($na_{2D}^2 \ll 1$) two dipole excitons repel each other like two parallel dipoles with the pair repulsion potential $U(R) = e^2D^2/(\epsilon R^3)$, where R is the distance between two excitons, and D is the inter-well septation. The collective excitations in this spectrum have the sound spectrum [21]: $\varepsilon_{X-X}(p) = c_s(D)p$. The sound velocity $c_s(D)$, when the electron and hole numbers are equal, is calculated in the ladder approximation assuming the vertex correction is equal the sum of the ladder diagrams and given by [7, 21]

$$c_s(D) = \left(\frac{4\pi\hbar^2 n}{M^2 \log\left(\frac{\epsilon^2\hbar^4}{8\pi s^2 n M^2 e^4 D^4}\right)}\right)^{1/2} . \qquad (6)$$

For the case when number of electrons is much greater than number of holes, taking into account the electron screening effects we assume the following phenomenological form of the exciton-exciton dipole repulsion potential in the presence of the 2DEG: $\tilde{U}(R) = \gamma(n, n_e, D)e^2D^2/(\epsilon R^3)$, where $\gamma(n, n_e, D) < 1$ is the coefficient reflecting the electron screening effects. This substitution results in the electron screening renormalization of the sound velocity:

$$\tilde{c}_s(D) = \left(\frac{4\pi\hbar^2 n}{M^2 \log\left(\frac{\epsilon^2\hbar^4}{8\pi s^2 n M^2 \gamma^2(n,D) e^4 D^4}\right)}\right)^{1/2} . \qquad (7)$$

It follows from Eq. (7) that $\tilde{c}_s(D) < c_s(D)$ due to the fact that $\gamma(n, n_e, D) < 1$. Therefore, the sound velocity for the collective excitation spectrum in the CQWs with the number of electrons greater than number of holes can be represented as $\tilde{c}_s(D) < \theta(n, n_e, D)c_s(D)$, where $\theta(n, n_e, D) < 1$ is the phenomenological parameter. The rest of the procedure for the calculation of the superfluid density and Kosterlitz-Thouless temperature is the same as for the single quantum well in the presence of 2DEG. The superfluid density for CQWs can be calculated by applying Eq. (3)