that the effective $X - X$ interaction pair potential becomes weaker due to screening by electrons [18]. We take into account this screening effect by introducing the following phenomenological form of the zero-order Fourier-component of the exciton-exciton repulsion potential in the presence of the 2DEG: $\tilde{U}_0 = \beta(n, n_e)U_0$, where $\beta(n, n_e) < 1$ is the coefficient reflecting the electron screening effects, and n_e is the electron density. This substitution causes the electron screening renormalization of the sound velocity $\tilde{c}_s = \beta(n, n_e)c_s$. Note that $\beta(n, n_e)$ can depend on the exciton density n and electron density n_e. The calculation of a more accurate phenomenological relationship will be addressed in future work.

The superfluid-normal phase transition in the 2D exciton system is the K-T transition [19]. The transition temperature $T_{\rm c}$, for the K-T transition to the superfluid state in a 2D exciton system is determined by the equation [19] $T_{\rm c} = \pi\hbar^2 n_{\rm s}(T_{\rm c})/2k_B M$, where $n_{\rm s}(T)$ is the superfluid density of the exciton system as a function of temperature T and k_B is Boltzmann' constant.

The function $n_{\rm s}(T)$ has been calculated from the relation $n_{\rm s} = n - n_n$ (n is the total exciton density, n_n is the normal component density). We determine the normal component density by means of the usual procedure [15, 20]. Let us suppose that the exciton system moves with velocity $\mathbf{u}$. At finite temperature T, dissipating quasiparticles will appear in this system. Since their density is small at low temperatures, one can assume that the gas of quasiparticles is an ideal Bose gas. To calculate the superfluid component density, we find the total current of quasiparticles in a frame in which the superfluid component is at rest. Then we obtain the mean total current of 2D excitons in the coordinate system, moving with a velocity $\mathbf{u}$:

$$\begin{aligned} \langle \mathbf{J} \rangle = \frac{1}{M} \langle \mathbf{p} \rangle = \frac{1}{M} s \int \frac{d\mathbf{p}}{(2\pi\hbar)^2} \mathbf{p} \\ \times f\left[\varepsilon_{X-X}(p) - \mathbf{p}\mathbf{u}\right] \ , \end{aligned} \tag{1}$$

where $f\left[\varepsilon_{X-X}(p)\right] = \left(\exp\left[\varepsilon_{X-X}(p)/(k_B T)\right] - 1\right)^{-1}$ is the Bose-Einstein distribution function, s is the level degeneracy (equal to 4 for excitons in GaAs quantum wells). Expanding the expression inside the integral in the first order by $\mathbf{p}\mathbf{u}/(k_B T)$, we have: