There is an error in the definition of θ_1 and therefore in the definition of θ and the phase ϕ^+ and ϕ in the case $\epsilon_V > 1/2$. The definition of θ_1 on page 1289 should be

$$\theta_1(x,\xi) = \begin{cases} \displaystyle\int_0^\infty V_A(x + 2t\xi - Ft^2\mathbf{e}_1) - \\ \qquad\qquad V_A(-R\mathbf{e}_1 + 2t\xi_\perp - Ft^2\mathbf{e}_1)\,dt & \text{if } \epsilon_V \le 1/2 \\ \displaystyle\int_0^\infty V_A(x + 2t\xi - Ft^2\mathbf{e}_1)\,dt & \text{if } \epsilon_V > 1/2. \end{cases}$$