The required integral to calculate:

$$T = \int_{-\infty}^{+\infty} dz e^{i\frac{\epsilon_i - \epsilon_j}{v} z} G(R)$$

where:

$$G(R) = \frac{1}{R^{l+1}} \int_0^R dx \, x^{n+l+1} \exp\left(-\frac{z_T x}{n_i} - ikx\right) \; {}_1F_1\left(l_\nu + 1 + i\gamma; 2l_\nu + 2\, ; 2ikx\right)$$

Our calculations gave us the following:

$$\int\limits_{-\infty}^{+\infty} dz \; R^{\lambda - l - 1} e^{-R\left[\frac{z_T}{n_i} + i\;\kappa(1-2t)\right] + i\frac{\varepsilon_i - \varepsilon_j}{v} z} = \int\limits_{-\infty}^{+\infty} dz \; \frac{e^{\alpha\sqrt{z^2+\rho^2} + idz}}{(z^2+\rho^2)^{m/2}}$$

$m = \lambda - l - 1$ m is an integer can take positive or negative value

$$\alpha = \left[\frac{z_T}{n_i} + i\;\kappa\,(1-2t)\right]$$
$$\frac{z_T}{n_i} \geq 0$$

$$d = \frac{\varepsilon_i - \varepsilon_j}{v} \qquad \text{can be positive or negative}$$

$$\overrightarrow{R} = \overrightarrow{z} + \overrightarrow{\rho}$$

$$R = \sqrt{z^2 + \rho^2}$$