Consider a Levy Walk(LW) model with constant velocity, power law flight length distribution $p(t)$, and power law waiting time distribution $\psi(t)$. Their asymptotic behavior can be represented as follows [1].

$$p(t) \sim |t|^{-(1+\alpha)} \tag{1}$$

$$\psi(t) \sim t^{-(1+\beta)}, \text{where t} > 0 \tag{2}$$

α and β are the indices of the distributions which give the exponent of the asymptotic power-law behaviors. α and β have a value between 0 and 2. The special case $\alpha = 2$ or $\beta = 2$ gives the Gaussian distribution, respectively. We consider continuous time random walk (CTRW) which have power law flight length and power law pause time, the relationship between γ and power law coefficients of α and β is known with an assumption of constant velocity [2] [3].

Theorem 1. *Assume a CTRW of which flight length and pause time distribution can be represented by Eq.(1) and Eq.(2) respectively. Then it is known that the diffusivity γ of that CTRW can be computed as follows.*

$$\gamma = \begin{cases} \min(2, 2-\alpha+\beta) & \alpha < 2, \quad \beta < 1 \\ \min(2, 3-\alpha) & \alpha < 2, \quad \beta \geq 1 \\ \beta & \alpha \geq 2, \quad \beta < 1 \\ 1 & \alpha \geq 2, \quad \beta \geq 1 \end{cases}$$

Proof. Refer to [2] [3]. □

1. REFERENCES

[1] J.Voit. *The Statistical Mechanics of Financial Markets*. Springer, 2005.

[2] A. Vazquez, O. Sotolongo-costa, and F. Brouers. Diffusion regimes in levy flights with trapping. *Physica A*, 264:424–431, 1999.

[3] G. Zumofen and J. Klafter. Laminar-localized-phase coexistence in dynamical systems. *Physical Review E*, 51(3):1818–1821, March 1995.