Occurrence scattering time in nonextensive plasmas

Myoung-Jae Lee[1,a], Young-Dae Jung[2,b]
[1] Department of Physics, Hanyang University, Seoul 04763, South Korea
[2] Department of Applied Physics, Hanyang University, Ansan, Kyunggi-Do 15588, South Korea
[a] e-mail: mjlee@hanyang.ac.kr
[b] e-mail: ydjung@hanyang.ac.kr

The essence of Tsallis q-entropy on the occurrence scattering time (OST) process is derived for a nonextensive plasma. The semiclassical eikonal dissection and the nonextensive q-distribution function are used to derive the OST with variables of projectile energy, scattering angle, electron entropic index, ion entropic index, and impact parameter. Our calculations find that the OST advance in a nonextensive plasma decreases with the entropic index. We have seen that the Tsallis q-entropy on the OST advance grows up fast as the scattering angle increases. We also obtained that the nature of Tsallis q-entropy on the OST advance diminishes in forward scattering direction in a nonextensive plasma. Moreover, the authority of the electron q-entropy is found to be greater than the that of ion q-entropy in the cold electron plasma, i.e., when the electron temperature is lower than the ion temperature. However, if the ion temperature is lower than the electron temperature, the authority of the ion q-entropy is more momentous than that of the electron q-entropy. This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korean Government (NRF-2019R1A2C1003363).

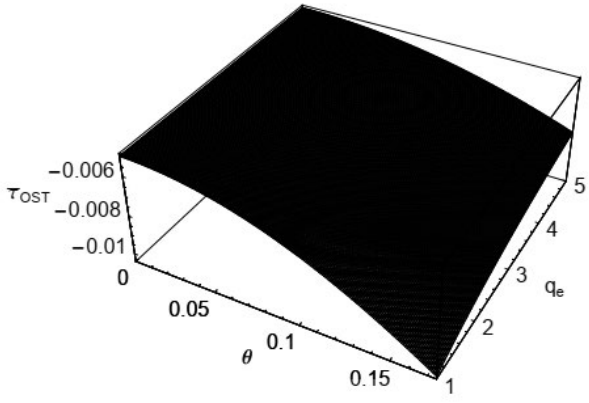

Figure 1. The surface illustration of the dimensionless OST advance $\overline{\tau}_{OST}$ when $\sigma = 1$, $q_i = 1$, and $\overline{E} = 10$.

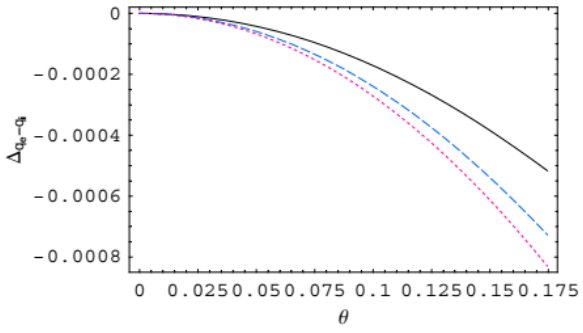

Figure 2. The characteristic function $\Delta_{q_e-q_i}$ when when $\sigma = 2$ and $\overline{E} = 30$. The black solid line portrays the case of $q_e = 2$ and $q_i = 2$. The blue dashed line portrays the condition of $q_e = 3$ and $q_i = 3$. The red dotted line portrays the condition of $q_e = 6$ and $q_i = 6$.

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