CHAPTER V
CONCLUSION

In conclusion, our research involves simulating light nuclei formation using UrQMD and conducting a series of data analyses. We begin by examining double ratios for the relevant light nuclei, followed by calculating the time evolution of proton number skewness and scaled variance along with their ratios (susceptibilities). Subsequently, we determine time-dependent proton number cumulants. The phase transition is influenced by the enhancements in the production of the baryons and the light nuclei at low beam energies. Our analysis covered the time evolution of these observables in both coordinate and momentum space, with the latter being particularly pertinent for experimental observations.

Overall, our findings within a central spherical volume consistently demonstrate that a strong first-order phase transition significantly alters the corresponding observables compared to a crossover scenario. The most pronounced changes were observed in the cumulant ratios σ^2/μ and $S\sigma$ of the net-baryon number.

For experimentally measurable proton number cumulants, the higher-order cumulants of free protons evaluated over wide rapidity windows ($\Delta y > 1$) show the greatest potential as sensitive observables.

Within a rapidity window of $\Delta y = 1$, the only notably distinct and potentially useful effect in light nuclei production was observed in the ratio $(N_{4_{He}} \times N_p)/(N_{3_{He}} \times N_d)$, which showed an approximately 10% enhancement at intermediate times. However, the signal weakens at later stages, decreasing the probability of detection in experiments.