HBT study of the nuclear reaction with neutron-rich nuclei at intermediate energy

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The method of two-particle intensity interferometry which was developed in the early 1950s by Hanbury Brown and Twiss (HBT) has its origin in astrophysics several decades ago [1]. It has significant theoretical development and widespread application in subatomic physics in recent years [2-4]. In the applications of experimental and theoretical heavy ion reactions at intermediate energy, various aspects have been investigated via the correlation functions, such as the dependence of the isospin of the emitting source [5], the impact parameter [6], the nuclear symmetrical energy [7] and the total momentum of nucleon pairs [8] and so on. Since the research about the exotic nuclei becomes more and more attractive [9-12], some groups have applied HBT technique to study the exotic nuclear reaction recently [13-14].

We performed the HBT study of the nuclear reaction induced by neutron-rich nuclei at intermediate energy [15-16]. After the feasibility has been testified via reproducing the experimental results, HBT results of the nucleon-nucleon correlation function have been presented for the nuclear reactions with neutron-rich projectiles (Be isotopes) using an event-generator, the Isospin-Dependent Quantum Molecular Dynamics model [17]. We explored that the relationship between the binding energy per nucleon of the projectiles and the strength of the neutron-proton HBT at small relative momentum. Moreover, we obtained the relationship between the single neutron separation energy and the strength of the halo neutron-proton HBT. Results show that neutron-proton HBT results are sensitive to binding energy or separation energy. In addition, the systematic studies of different light systems have also been done.

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