



Contribution ID: 40

Type: not specified

Study on the shell structure of ^{11}C with alpha scattering by using MATE

Wednesday, 5 March 2025 15:20 (1 minute)

The nuclear shell structure provides an important guide for our understanding of the nuclear structure and the underlying nuclear forces. Following a series of studies on the weakly-bound nuclear region far away from the stability line, many exotic phenomena have been found, such as the emergence of new magic numbers. The study of new magic numbers can provide us with a good perspective to understand the evolution of the nuclear shell structure. Recently, the existence of the new proton magic number $Z = 6$ was found in the neutron-rich carbon isotopes, which raised the question of whether the $Z = 6$ magic number persists in the neutron-deficient carbon isotopes. At present, there exist only the experimental results of ^{10}C on the neutron-deficient side, which shows greater neutron contribution to E2 transition than that of protons. To further investigate the neutron-deficient carbon isotopes, we carried out an alpha inelastic scattering experiment to study the structure of ^{11}C .

The $\alpha(^{11}\text{C}, \alpha^*)$ experiment was carried out at the RIBLL1, HIRFL. A primary beam ^{12}C bombarded a beryllium target to produce a 55-MeV/u secondary beam ^{11}C . The ^{11}C beam was incident on an active target Time Projection Chamber (TPC) named MATE (Multi-purpose Active target Time projection chamber for nuclear astrophysical and exotic beam Experiments). MATE is a new detector developed at IMP in recent years, and is mainly composed of TPC and silicon detectors. By measuring the yield of the recoil alpha particles, a differential cross section can be obtained. The ratio of the neutron and proton contribution to the excitation M_n/M_p will be obtained from reaction theory analysis, combining the results from this work and earlier (p, p') measurement. The results will shed light on the important question of whether or not there exists a proton subshell closure in ^{11}C . The experimental data is currently being further analyzed.

Type of contribution

Are you a student or postdoc?

yes

Primary author: ZHANG, Zhichao (IMP,CAS)

Co-author: ONG, Hooi Jin (Institute of Modern Physics, Chinese Academy of Sciences)

Presenter: ZHANG, Zhichao (IMP,CAS)

Session Classification: Poster session