



Contribution ID: 218

Type: **Contributed Oral Presentation**

The observation of a candidate for BEC-like state in ^{14}C

Monday, 26 May 2025 14:40 (15 minutes)

In the framework of Tohsaki-Horiuchi-Schuck-Röpke (THSR) wave function approach, the 0_2^+ state at 7.65 MeV in ^{12}C (Hoyle state) is recognized as featuring the Bose-Einstein Condensation (BEC) state [1]. When one α -particle in ^{12}C is replaced with ^6He , a system of three bosons can also be formed. And if all clusters are moving in relative s-wave, it represents a possible Hoyle-like configuration for ^{14}C [2].

Based on the above-mentioned anticipation, we conducted an experiment using ^{14}C as the projectile which was excited to very high lying states followed by three-cluster decay. This experiment was carried out at the Radioactive Ion Beam Line at the Heavy Ion Research Facility in Lanzhou (HIRFL-RIBLL1). Special efforts were devoted to coincidentally measure and identify three helium clusters at forward angles.

A prominent resonance above the $^6\text{He} + 2\alpha$ threshold were firmly identified after selecting the $^8\text{Be}(\text{g.s.}) + ^6\text{He}$ decay channel. Analysis of angular correlation and decay suggests a spin-parity assignment of $J^\pi = 0^+$. Our finding is further supported by the microscopic $3\alpha + 2n$ GCM model and Control neural network calculations, which provides a valuable insight into the structural and dynamic behavior of unstable nuclei.

[1]. FREER M, FYNBO H. Progress in Particle and Nuclear Physics, 2014, 78: 1. DOI: 10.1016/j.ppnp.2014.06.001. <https://doi.org/10.1007/s41365-024-01588-x>

[2] K. Wei, Y. Ye and Z. Yang, "Clustering in nuclei: progress and perspectives", Nucl. Sci. Tech. 35, 216(2024), <https://doi.org/10.1007/s41365-024-01588-x>

Primary author: WEI, Kang (School of Physics, Peking University)

Co-author: YE, Yanlin (Peking University)

Presenter: WEI, Kang (School of Physics, Peking University)

Session Classification: Parallel Session

Track Classification: Nuclear Structure