Contribution ID: **21** Type: **not specified**

Characterization of the 2+ excitation of the Hoyle state in 12C

For many years there has been a question mark over the location of the 2⁺ excitation of the Hoyle state in ¹²C. Several measurements were performed to search for this state. A measurement which published in 1971 showed the existence of a 11.16 MeV 2⁺ state in ¹²C. This state was assumed to be a candidate for the 2⁺ excited state of the Hoyle state. However, the existence of this state was not confirmed by other studies. Recent measurements to search for the 2⁺ excited state of the Hoyle state indicated that a 2⁺ state may exist around 10MeV, which is in contradiction with the 1971 measurements. In 2004, Itoh et al. published (α,α') data that showed that there is strong evidence for a 2⁺ state in ¹²C lie at 10 MeV region. Since then there have been several other measurements which supported these claims. With interest in locating the 2⁺ excitation of the Hoyle state growing rapidly, it was considered important to perform a set of experiments with improved equipment and analysis techniques available today, to provide answers regarding these contradicting claims about the location of this state. The first experiment was performed at iThemba LABS with the high energy resolution K600 magnetic spectrometer to investigate the ¹¹B(³He,d)¹²C reaction for an incident beam energy of 44 MeV to search for the 2⁺ state in the 11.16 MeV region. These experimental conditions mirrors those used in the 1971 study. Measurements were performed at the three spectrometer angles where a clear signature was reported in the previous measurement. The results from the recently published data analysis will be presented.

The second experiment intended to search for the 2⁺ excitation of the Hoyle state in the 10 MeV region was recently completed. The experiment was also performed at iThemba LABS with the high energy resolution K600 magnetic spectrometer using the ¹⁴C(p,t)¹²C reaction with a 66 MeV proton beam. Data analysis of these measurements is underway. Preliminary results will be presented in this talk.

Primary author: Mr NEMULODI, Fhumulani (iThemba LABS)

Co-authors: Dr STEYN, Deon (iThemba LABS); Dr SMIT, Frederick (iThemba LABS); Dr USMAN, Iyabo (University of the Witwatersrand); Mr SWARTZ, Jacobus (iThemba LABS); Prof. CARTER, John (University of the Witwatersrand); Dr FREER, Martin (University of Birmingham); Mr JINGO, Maxwell (University of the Witwatersrand); Mr KUREBA, Oscar (University of the Witwatersrand); Dr PAPKA, Paul (university of stellenbosch); Dr NEVELING, Retief (iThemba LABS); Dr FORTSCH, Siegfried (iThemba LABS); Dr BUTHELEZI, Zinhle (iThemba LABS)

Presenter: Mr NEMULODI, Fhumulani (iThemba LABS)