Contribution ID: **91** Type: **Invited talk**

Background (α, n) reactions at low energies: $^{10,11}\mathbf{B}(\alpha, n)^{13,14}\mathbf{N}$

Tuesday, 20 June 2017 15:00 (30 minutes)

%
% Nuclear Physics in Astrophysics 8 template for abstract
%
% Format: LaTeX2e.
%
% Rename this file to name.tex, where 'name' is the family name
% of the first author, and edit it to produce your abstract.
%
\documentstyle[11pt]{article}
%
% PAGE LAYOUT:
%
\textheight=9.9in
\textwidth=6.3in
\voffset -0.85in
\hoffset -0.35in
\topmargin 0.305in
\oddsidemargin +0.35in
\evensidemargin -0.35in

%\renewcommand{\rmdefault}{ptm} % to use Times font

\long\def\TITLE#1{{\Large{\bf#1}}}\long\def\AUTHORS#1{ #1\\[3mm]}
\long\def\AFFILIATION#1#2{[1] #2\\}
\begin{document}
{\small \it Nuclear Physics in Astrophysics 8, NPA8: 18-23 June 2017, Catania, Italy}

\vspace{12pt}

\thispagestyle{empty}

\begin{center}
%%%
%%% Title goes here.
%%%
\TITLE{Background (α, n) reactions at low energies: ^{10,11}B$(\alpha, n)^{13,14}$N }\\[3mm]
%%%
%%% Authors and affiliations are next. The presenter should be
%%% underlined as shown below.
%%%
\AUTHORS{R.J.~deBoer[1,2], Q.~Liu[1,2], M.~Febbraro[3], S.D.~Pain[3], R.~Toomey[3,4], and M.~Wiescher[1,2] }

%%%
{\small \it
\AFFILIATION{1}{The Joint Institute for Nuclear Astrophysics}

\AFFILIATION{2}{Department of Physics, University of Notre Dame, Notre Dame, Indiana 46556 USA}
\AFFILIATION{3}{Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830, USA}
\AFFILIATION{4}{Rutgers University, Piscataway, New Jersey 08854, USA}

}
%%%
\vspace{12pt} % Do not modify

% Enter contact e-mail address here.

\centerline{Contact email: {\it rdeboer1@nd.edu}}

\vspace{18pt} % Do not modify

\end{center}
%%%
%%% Abstract proper starts here.
%%%
New underground facilities like CASPAR and LUNA-MV, which are set to begin operation in the next few years, will push α-induced reaction measurements to record low energies. Of particular interest are the neutron-producing reactions ^{13}C$(\alpha,n)^{16}$O and ^{22}Ne$(\alpha,n)^{25}$Mg, which fuel the s process. At low energies these cross sections are dominated by their Coulomb penetrabilities. In addition, the relative difference in Coulomb penetrabilities for α-induced reactions on targets with different charge Z, is much larger than for their proton-induced counter parts. Yet already small amounts of contaminant material, of lower Z than the target material of interest, have been observed to induce large background yields in proton-induced capture reactions. Therefore, the study of low Z background reactions is critical for both the planning and interpretation of future low energy measurements of the ^{13}C$(\alpha,n)^{16}$O and ^{22}Ne$(\alpha,n)^{25}$Mg reactions. This is especially true if a counter type detector will be used, e.g. ^{3}He, that is insensitive to neutron energy. As boron is a common trace material in solid targets, and has already been observed as a contaminant in (p,γ) measurements (e.g. [1]), this paper reports on a new study of the ^{10,11}B$(\alpha,n)^{13,14}$N reactions. Measurements have been performed at the University of Notre Dame's Nuclear Science Laboratory using the Santa Anna 5~MV accelerator. Both a traditional ^{3}He counter and a new type of deuterated scintillation detector [2], which is sensitive to the neutron energy, have been utilized.

This research was supported by the National Science Foundation through Grant No. Phys-0758100, the Joint Institute for Nuclear Astrophysics through Grant No. Phys-0822648 and PHY-1430152 (JINA Center for the Evolution of the Elements), and the Department of Energy Office of Science.
\bigskip
{\small

\noindent [1] A.~Di~Leva \textit{et al.}, Phys. Rev. C {\bf 89} 015803 (2014);

\noindent [2] F.D.~Becchetti \textit{et al.}, Nucl. Instrum. Methods A{\bf 820} 112 (2016).
%%%
%%% End of abstract.
%%%
\end{document}

Primary author: Dr DEBOER, Richard (University of Notre Dame)

Co-authors: Dr FEBBRARO, Michael (Oak Ridge National Laboratory); Prof. WIESCHER, Michael (University of Notre Dame); Mrs LIU, Qian (University of Notre Dame); Ms TOOMEY, Rebecca (Rutgers University); Dr PAIN, Steven (Oak Ridge National Laboratory)

Presenter: Dr DEBOER, Richard (University of Notre Dame)

Session Classification: Direct measurements 2

Track Classification: Underground nuclear astrophysics