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Measurements Of Stellar And Big-Bang Nucleosynthesis Reactions Using Inertially-Confined Plasmas

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% % 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 $\label{eq:longdef} \label{eq:longdef} \label{eq:l$ $\log\left(\frac{1 \#2}{1 \#2}\right)$ \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{Measurements Of Stellar And Big-Bang Nucleosynthesis Reactions Using Inertially-Confined Plasmas }\\[3mm] %%% %%% Authors and affiliations are next. The presenter should be %%% underlined as shown below. %%% \AUTHORS{A.B. Zylstra¹, H.W. Herrmann¹, M. Gatu Johnson², Y.H. Kim¹, J.A. Frenje², G. Hale¹, C.K. Li², M. Rubery³, M. Paris¹, A. Bacher⁴, C.R. Brune⁵, D.T. Casey⁷, C. Forrest⁶, V. Yu. Glebov⁶, R. Janezic⁶, D. McNabb⁷, A. Nikroo⁷, J. Pino⁷, T.C. Sangster⁶, D.B. Sayre⁷, F.H. S{\'e}guin², H. Sio², C. Stoeckl⁶, R.D. Petrasso² }

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The ³He+³He, T+³He, and p+D reactions directly relevant to either Stellar or Big-Bang Nucleosynthesis (BBN) have been studied at the OMEGA laser facility using inertially-confined plasmas. These high-temperature plasmas are created using shock-driven 'exploding pusher' implosions. The advantage of using these plasmas is that they better mimic astrophysical systems than cold-target accelerator experiments. A new measured S-factor for the T(³He, γ)⁶Li reaction rules out an anomalously-high ⁶Li production during the Big Bang as an explanation to the high observed values in metal poor first generation stars. Our value is also inconsistent with values used in previous BBN calculations [1]. In a second experiment, proton spectra from the ³He+³He and T+³He reactions are used to constrain nuclear R-matrix modeling. The spectral shapes disagree with R-matrix calculations using coefficients derived from fits to T+T data at higher or lower center-of-mass energy. Finally, recent experiments have probed the p+D reaction for the first time in a plasma; this reaction is relevant to energy production in protostars, brown dwarfs, and at higher CM energies, to BBN. The first plasma data is consistent with previous accelerator experiments at $E_{cm} \sim 16$ keV, work is ongoing to further reduce our experimental uncertainties.

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\noindent [1] A.B. Zylstra et al., Phys. Rev. Lett. 117, 035002 (2016).

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