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PO FSE ABRUZZO 2007»2013 OBIETTIVO "Competitività regionale e occupazione"

REGIONE ABRUZZO

Progetto Speciale Multiasse "Sistema Sapere e Crescita"
PO FSE Abruzzo 2007-2013, Piano Operativo 2012-2013

CFA LECTURE SERIES

Andreas Best
INFN - LNGS

Measurement of the reactions 17O(a,n)20Ne and 17O(a,g)21Ne and their impact on the s process in massive stars

The ratio of the reaction rates of the competing channels $^{17}O(\alpha,\gamma)^{21}Ne$ and $^{17}O(\alpha,n)^{20}Ne$ determines the efficiency of ^{16}O as a neutron poison in the s process in low metallicity rotating stars. It has a large impact on the element production, either producing elements to the mass range of A=90 in case of a significant poisoning effect or extending the mass range up to the region of A=150 if the γ channel is of negligible strength.
We present results of the first measurement of the reaction $^{17}O(\alpha,\gamma)^{21}Ne$ and an improved study of the reaction $^{17}O(\alpha,n)^{20}Ne$, including an independent measurement of the $^{17}O(\alpha,n1)^{20}Ne$ channel. A simultaneous R-Matrix fit to both the n0 and the n1 channels has been performed. New reaction rates have been calculated and used as input for stellar network calculations and their impact on the s process in rotating massive stars is discussed.

Louis Wagner
HZDR, TU Dresden

$^{14}N(p,\gamma)^{15}O$ data at high energy

The $^{14}N(p,\gamma)^{15}O$ reaction determines the rate of the CNO cycle because it's the slowest nuclear reaction of the cycle. For a precise cross section extrapolation to low energies one needs accurate knowledge of the excitation function over a wide range of energy. Therefore the non-resonant cross section of $^{14}N(p,\gamma)^{15}O$ was studied at beam energies of 0.5 - 1.5 MeV at the 3 MV Tandetron of Helmholtz-Zentrum Dresden-Rossendorf. The talk presents the preliminary new data for the cross section of $^{14}N(p,\gamma)^{15}O$. With a R-matrix fit they could contribute to a more accurate extrapolation to the astro-physically relevant cross section at the Gamow-window of the reaction.

FEBRUARY 6, 2014 – 2:30 PM
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