Abstract Submitted
for the HAW09 Meeting of
The American Physical Society

Triple-α Process in Hot Astrophysical Scenarios N.R. PATEL, U. GREIFE, CO School of Mines, K.E. REHM, C.M. DEIBEL, J. GREENE, D. HENDERSON, C.L. JIANG, B.P. KAY, H.Y. LEE, R. PARDO, K. TEH, Argonne National Laboratory, S.T. MARLEY, Western Michigan University, M. NOTANI, X.D. TANG, University of Notre Dame — The production of carbon in red giant stars relies significantly on the 1^{st} 0^+ excited state of ^{12}C at 7.65 MeV (the Hoyle state). The recent NACRE listing assumes a 2^+ resonance at 9.1 MeV,[1] which could be considered as the 2^+ member of a deformed rotational band built on the Hoyle state. At temperatures of several billion Kelvin in explosive scenarios like supernovae where the 3α process is also relevant, this state would increase the astrophysical reaction rate by an order of magnitude.[2] In order to determine this experimentally, the states of ^{12}C were populated through β-decay of ^{12}B and ^{12}N mirror nuclei produced at the ATLAS in-flight facility at Argonne. The decay of ^{12}C* into three alphas were detected in a twin ionization chamber, acting as a 4π calorimeter. This minimized the effect of β-summing and allowed us to investigate the minimum between the 1^{st} and the 2^{nd} 0^+ state with much better accuracy than previously possible. An R-Matrix analysis was performed to determine an upper limit on the 2^+ resonance in the 8-11 MeV region. Our data analysis thus far shows no evidence of a 2^+ state in this region. This work is supported by U.S. DOE, and NSF grants.

[1]Angulo *et al*, Nucl. Phys. **A656** (1999)
[2]Fynbo *et al*, Nature **433** (2005)

Nidhi Patel
Colorado School of Mines

Date submitted: 06 Jul 2009 Electronic form version 1.4