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Measurements of the ^{16}C + ^{12}C and ^{16}C + ^{13}C Total Fusion Cross Sections with Implications for Astrophysics[1] ASHLEY HOOD, Texas AM University, Louisiana State University, J. BLACKMON, C. DEIBEL, E. GOOD, A. LAMINACK, S. MARLEY, G. WILSON, Louisiana State University, K. AURANEN, M. AVILA, C. HOFFMAN, C. L. JIANG, J. LI, E. REHM, D. SANTIAGO-GONZALEZ, S. STOLZE, R. TANG, X. YAN, Argonne National Laboratory, W. J. ONG, Lawrence Livermore National Laboratory — X-ray superbursts are powered by runaway thermonuclear burning deep inside of a neutron star, where the pycnonuclear fusion of neutron-rich isotopes may be an important heat source. We measured the total fusion cross sections of ^{16}C + ^{12}C and ^{16}C + ^{13}C for $E_{C.M.}$ = 8 - 22 MeV. The experiment was conducted using the active-target MUlti-Sampling Ionization Chamber (MUSIC) detector at the Argonne Tandem LINAC Accelerator System (ATLAS) facility at Argonne National Lab using a radioactive ^{16}C beam. The measured cross sections show good agreement with theoretical models. While studies indicate that ^{16}C has a larger mean radius than ^{15}C, the ^{16}C + ^{12,13}C cross sections are measured to be smaller than the ^{15}C + ^{12}C cross section. This indicates that an enhanced s-wave tail of the ^{15}C wave function might be increasing the ^{15}C fusion cross section or that neutron pairing effects in ^{16}C may reduce the ^{16}C cross sections.

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