Angular Distribution Anisotropy of the $E_{c.m.} = 2.68$-MeV Resonance in the $^{12}$C($^{\alpha}, \gamma$)$^{16}$O Reaction\textsuperscript{1} DANIEL SAYRE, CARL BRUNE, DONALD CARTER, THOMAS MASSEY, JOHN O’DONNELL, Ohio University — The $^{12}$C($^{\alpha}, \gamma$)$^{16}$O reaction, in combination with the triple-alpha process, determines the $^{12}$C/$^{16}$O fraction at the end of stellar helium-burning. This fraction has been shown to strongly influence any subsequent stellar evolution and, due to imprecise knowledge of $^{12}$C($^{\alpha}, \gamma$)$^{16}$O reaction rate, severely complicate precision tests of stellar models. A large uncertainty in the reaction belongs to the cross section for electric-quadrupole ($E2$) capture into the ground state of $^{16}$O. A prominent feature in the measured $E2$ cross section is the narrow resonance at $E = 2.68$ MeV. The resonance affects the $E2$ cross section over a region of experimental significance. How the resonance affects the cross section depends on the relative sign of its amplitude to other $E2$ amplitudes. The sign is not well determined by existing capture data and has a non-negligible effect on extrapolating the $E2$ cross section to helium-burning energies ($E_0$). Details about the recent measurement of the sign at the Ohio University Accelerator Laboratory and its importance for a new $E2$ cross section at $E_0$ will be discussed.

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