

The Multiplicity of Massive Stars: A High Angular Resolution Survey with the HST Fine Guidance Sensor

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We present the results of an all-sky survey made with the Fine Guidance Sensor on Hubble Space Telescope to search for angularly resolved binary systems among the massive stars. The sample of 224 stars is comprised mainly of Galactic O- and B-type stars and Luminous Blue Variables, plus a few luminous stars in the Large Magellanic Cloud. The FGS TRANS mode observations are sensitive to detection of companions with an angular separation between $0.''01$ and $1.''0$ and brighter than $\Delta m = 5$. The FGS observations resolved 52 binary and 6 triple star systems and detected partially resolved binaries in 7 additional targets (43 of these are new detections). These numbers yield a companion detection frequency of 29% for the FGS survey. We also gathered literature results on the numbers of close spectroscopic binaries and wider astrometric binaries among the sample, and we present estimates of the frequency of multiple systems and the companion frequency for subsets of stars residing in clusters and associations, field stars, and runaway stars. These results confirm the high multiplicity fraction, especially among massive stars in clusters and associations. We show that the period distribution is approximately flat in increments of $\log P$. We identify a number of systems of potential interest for long term orbital determinations, and we note the importance of some of these companions for the interpretation of the radial velocities and light curves of close binaries that have third companions.

Reference: The Astronomical Journal

Status: Manuscript has been accepted

Weblink: <http://arxiv.org/abs/1410.0021>

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