

The Search for Low-mass Companions of B Stars in the Carina Nebula Cluster Trumpler 16

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We have developed lists of likely B3--A0 stars (called "late B" stars) in the young cluster Trumpler 16. The following criteria were used: location within 3' of Eta Car, an appropriate V and B-V combination, and proper motion (where available). Color and magnitude cuts have been made assuming an $E(B-V) = 0.55$ mag ± 0.1 , which is a good approximation close to the center of Trumpler 16. These lists have been cross-correlated with X-ray sources found in the Chandra Carina Complex Project (CCCP). Previous studies have shown that only very rarely (if at all) do late main sequence B stars produce X-rays. We present evidence that the X-ray detected sources are binaries with low-mass companions, since stars less massive than 1.4 Msun are strong X-ray sources at the age of the cluster. Both the median X-ray energies and X-ray luminosities of these sources are in good agreement with values for typical low-mass coronal X-ray sources. We find that 39% of the late B stars based on a list with proper motions have low-mass companions. Similarly, 32% of a sample without proper motions have low-mass companions. We discuss the X-ray detection completeness. These results on low-mass companions of intermediate mass stars are complementary to spectroscopic and interferometric results, and probe new parameter space of low mass companions at all separations. They do not support a steeply rising distribution of mass ratios to low masses for intermediate-mass (5 Msun) primaries, such as would be found by random pairing from the Initial Mass Function.

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