

# The little-studied cluster Berkeley 90. I. LS III +46 11: a very massive O3.5 If\* + O3.5 If\* binary.

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CONTEXT. It appears that most (if not all) massive stars are born in multiple systems. At the same time, the most massive binaries are hard to find due to their low numbers throughout the Galaxy and the implied large distances and extinctions.

AIMS. We want to study: [a] LS III +46 11, identified in this paper as a very massive binary; [b] another nearby massive system, LS III +46 12; and [c] the surrounding stellar cluster, Berkeley 90.

METHODS. Most of the data used in this paper are multi-epoch high-S/N optical spectra though we also use Lucky Imaging and archival photometry. The spectra are reduced with devoted pipelines and processed with our own software, such as a spectroscopic-orbit code, CHORIZOS, and MGB.

RESULTS LS III +46 11 is identified as a new very-early-O-type spectroscopic binary [O3.5 If\* + O3.5 If\*] and LS III +46 12 as another early O-type system [O4.5 V((f))]. We measure a 97.2-day period for LS III +46 12 and derive minimum masses of  $38.80 \pm 0.83 M_{\text{Sol}}$  and  $35.60 \pm 0.77 M_{\text{Sol}}$  for its two stars. We measure the extinction to both stars, estimate the distance, search for optical companions, and study the surrounding cluster. In doing so, a variable extinction is found as well as discrepant results for the distance. We discuss possible explanations and suggest that LS III +46 12 may be a hidden binary system, where the companion is currently undetected.

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