New Evidence for Sub-Solar Mass Black Holes From LIGO

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The possible existence of sub-solar mass black holes poses a challenge to current models of stellar evolution, as there is no known formation mechanism to produce such objects. There is some evidence that the Laser Interferometer Gravitational-Wave Observatory (LIGO) has already detected sub-solar mass black holes. However, the uncertainties on the masses of most of their candidate detections have not been measured. We perform a full parameter estimation (PE) using Bayesian inference, on 3 candidate signals identified during a dedicated search of LIGO's O3b observing run. We report that, if real, at least one component mass from all three binaries is firmly below 1 M?, pointing towards the existence of a compact object with some unknown formation mechanism. All objects present network signal-to-noise ratios (SNR) consistent with the O3b detection threshold (=8). Although LIGO estimates that one or more of these subsolar-mass black hole detections could be spurious, there is a combined 89% chance that at least one is real. This tentative evidence, in combination with future data, could point toward the existence of primordial black holes formed in the inflationary epochs of the early Universe.

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