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Search for intermediate mass black hole binaries in the first observing run of Advanced LIGO

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During their first observational run (O1), the two Advanced LIGO detectors attained an unprecedented sensitivity, resulting in the first direct detections of gravitational-wave signals produced by stellar-mass binary black hole systems. We present here the results of the O1 all-sky search for gravitational waves (GWs) from merging intermediate mass black hole binaries (IMBHs). Two independent search techniques were used in this study: the first employs a matched-filter algorithm that uses a bank of filters covering the GW signal parameter space, while the second is a generic search for GW transients (bursts). No GWs from IMBHs were detected, thus we constrain the rate of several classes of IMBHB mergers. The most stringent limit is obtained for black holes of individual mass $100 M_{\odot}$, with spins aligned with the binary orbital angular momentum. For such systems, the merger rate is constrained to be less than $0.93 \text{ Gpc}^{-3} \text{ yr}^{-1}$ in comoving units at the 90% confidence level, an improvement of nearly two orders of magnitude over previous upper limits.

Auteur principal: Dr SALEMI, Francesco (AEI - Hannover)

Orateur: Dr SALEMI, Francesco (AEI - Hannover)

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