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Explaining LIGOs observations via isolated binary evolution with natal kicks[1] MICHAEL KESDEN, University of Texas at Dallas, DANIEL WYSOCKI, Rochester Institute of Technology, DAVIDE GEROSA, California Institute of Technology, RICHARD OSHAUGHNESSY, Rochester Institute of Technology, KRZYSZTOF BELCZYNSKI, Nicolaus Copernicus Astronomical Centre, Polish Academy of Sciences, WOJCIECH GLADYSZ, Astronomical Observatory, Warsaw University, EMANUELE BERTI, The University of Mississippi, DANIEL HOLZ, University of Chicago — We compare binary evolution models with different assumptions about black-hole natal kicks to the first gravitational-wave observations performed by the LIGO detectors. Our comparisons attempt to reconcile merger rate, masses, spins, and spin-orbit misalignments of all of current observations with state-of-the-art formation scenarios of binary black holes formed in isolation. We estimate that black holes should receive natal kicks at birth of the order of $\sigma \simeq 200(50)$ km/s if tidal processes do (not) realign stellar spins. Our estimate is driven by two simple factors. The natal kick dispersion σ is bounded from above because large kicks disrupt too many binaries (reducing the merger rate below the observed value). Conversely, the natal kick distribution is bounded from below because modest kicks are needed to produce a range of spin-orbit misalignments. A distribution of misalignments increases our models compatibility with LIGOs observations, if all BHs are likely to have natal spins.

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