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Resolving Topological Features of Black Hole Event Horizons JEFF KAPLAN, MICHAEL COHEN, MARK SCHEEL, California Institute of Technology — We examine the structure of the event horizon for numerical simulations of two black holes that begin in a quasicircular orbit, inspiral, and finally merge. We find that the spatial cross section of the merged event horizon has spherical topology (to the limit of our resolution), despite the expectation that generic binary black hole mergers in the absence of symmetries should result in an event horizon that briefly has a toroidal cross section. We investigate how the choice of time slicing affects both the spatial cross section of the event horizon and the locus of points at which generators of the event horizon cross. Building on previous work and using the intuition gained from our numerical results, we deduce the precise mathematical condition necessary for the existence of a toroidal horizon in a given spatial slice. Since we seek to make claims about topological features of the event horizon, we ensure the robustness of our conclusions by checking our results at multiple numerical resolutions. We find that the structure of the horizon generators in our simulations is consistent with expectations, and the lack of toroidal horizons in our simulations is due to our choice of time slicing.

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