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Gravitational Waves from a Black Hole Traversing a Lorentzian Wormhole WILLIAM GABELLA, Department of Physics and Astronomy, Vanderbilt University, Nashville, TN 37235 USA, JAMES DENT, Department of Physics, Sam Houston State University, Huntsville, TX 77341 USA, KELLY HOLLEY-BOCKELMANN[1], THOMAS KEPHART, Department of Physics and Astronomy, Vanderbilt University, Nashville, TN 37235 USA — We calculate the gravitational radiation from a black hole moving back and forth through a traversable, Lorentzian wormhole. The wormhole considered connects two regions of spacetime, either in the same universe or different ones, and the throat is held open by so-called exotic matter. The black hole orbiting the wormhole eventually loses energy through gravitational radiation and settles down onto the wormhole throat. We discuss several types of orbits that the black hole may take while traversing from one universe to the one on the other side. We propose looking at LIGO data for possible generic signatures of the gravitational wave emission, like the reverse frequency chirp as a black hole comes out of the wormhole into our universe, only to reach a maximum in its orbit and spiral back into the wormhole. Such a search can put limits on the number of wormholes in the volume of space observable by LIGO.

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