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Forecasts for detecting the gravitational-wave memory effect with Advanced LIGO and Virgo DAVID NICHOLS, University of Virginia, OLIVER BOERSMA, University of Amsterdam, PATRICIA SCHMIDT, University of Birmingham — One distinctive and measurable effect from the merger of binary black holes (BBHs) associated with strong curvature and high gravitational-wave (GW) luminosities is the nonlinear GW memory effect. The GW memory effect causes the proper distance between freely falling observers to differ before and after a burst of GWs passes by their locations. The advanced LIGO and Virgo detectors will observe the GW memory effect from a single BBH merger only if the event is significantly more massive or closer than any previously detected GW event. Finding evidence for the GW memory effect within the entire population of BBH mergers detected by LIGO and Virgo is more likely, because it has been shown that the GW memory effect could be detected in a population of BBHs consisting of binaries like the first GW150914 event after roughly 100 detections. Here, we examine when the advanced LIGO and Virgo detectors (at design sensitivity) will find evidence for the GW memory effect in a population of BBHs consistent with the measured population of events in the first two observing runs of the LIGO and Virgo detectors. We find that after five years of data collected by the advanced LIGO and Virgo detectors the nonlinear GW memory effect will be on the verge of detection.

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