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Gravitational wave spectroscopy of binary neutron star merger remnants with mode stacking HUAN YANG, Perimeter Inst for Theo Phys, VASILEIOS PASCHALIDIS, University of Arizona, KENT YAGI, Virginia University, LUIS LEHNER, Perimeter Inst for Theo Phys, FRANS PRETORIUS, Princeton University, NICOLAS YUNES, Montana State University — A binary neutron star merger event has recently been observed for the first time in gravitational waves, and many more detections are expected in the near future. The post-merger signal, however, can only be expected to be measurable by current detectors for events closer than roughly 10 Mpcs, which given merger rate estimates implies a low probability of observation within the expected lifetime of these detectors. We carry out Monte-Carlo simulations to investigate the chance of detecting that the dominant post-merger mode from individual binary neutron star mergers. To boost the post-merger detection probability, we propose two methods that stack the post-merger signal from multiple binary neutron star observations. The first method follows a commonly-used practice of multiplying the Bayes factors of individual events. The second method relies on an assumption that the mode phase can be determined from the inspiral waveform, so that coherent mode stacking of the data from different events becomes possible. We find that both methods significantly improve the chances of detecting the dominant post-merger signal, making a detection very likely after a year of observation using third-generation detectors (e.g., Cosmic Explorer).

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