Pop III binary black holes detections using the next generation gravitational-wave detectors[1] KEN NG, SALVATORE VITALE, Massachusetts Institute of Technology, WILL FARR, CCA at the Flatiron Institute, Stony Brook University, CARL RODRIGUEZ, McWilliams Center for Cosmology at Carnegie Mellon University — Future gravitational-wave (GW) detector networks will detect binary-black-hole mergers (BBHs) up to redshift of z 20, allowing for a direct measurement of the merger history in the early universe. Here we show how GW detections of BBHs made by proposed third-generation detectors can be used to search for the Population III (Pop III) binaries dominating at redshift z 10. To identify these Pop III binaries, we first perform a mock data analysis based on the redshift distribution predicted by cosmological simulation, and infer its characteristic peak using Gaussian process regression. Then, we employ phenomenological models to further extract the branching ratio between the Pop III BBHs and the Pop I/II BBHs, as well as the characteristic shape parameters of the subpopulations. With one month of observations at the predicted rate of 200 Pop III BBHs per month, parameters describing its volumetric merger rate can be constrained at the O(10

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