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Abstract

We assess detection of a nano-Hertz gravitational wave background using millisecond pulsars by considering red and white noise in timing residuals from the neutron star, magnetosphere, and interstellar medium. We evaluate how many MSPs are needed in a high-cadence, 5-year timing program. Unless a sample of 20 super-stable millisecond pulsars can be found (those with non-GW contributions less than 20 ns) a much larger program on 50 to 100 MSPs will require substantial fractions of time on existing