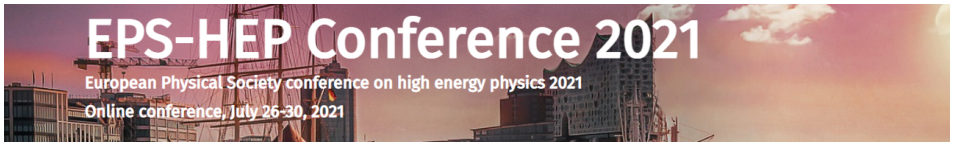

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Anchoring supermassive black hole binaries to active galactic nuclei with the gravitational-wave background

The nanohertz gravitational wave background (GWB) is believed to be dominated by emission from supermassive black hole binaries (SMBHBs). This population's properties have commonly been investigated using major galaxy mergers as a proxy for SMBHB formation. However, the observation of several dual active galactic nuclei (AGN) strongly suggests a link between AGN and SMBHBs, given that these dual AGN systems will eventually form a bound binary pair. Here we present a complementary model of the SMBHB population using AGN as a proxy for SMBHB systems instead of galaxy mergers. We compare the GWB generated by this AGN-proxy model and its major merger counterparts to the common-spectrum process in the NANOGrav 12.5-yr dataset. Finding the GWB generated by these models to be generally lower, we estimate how many more SMBHB sources are needed to generate a background like the NANOGrav 12.5-yr signal.

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