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Imprint of inflationary gravitational waves and WIMP dark matter in pulsar timing array data

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Motivated by the recent release of new results from five different pulsar timing array (PTA) experiments claiming to have found compelling evidence for primordial gravitational waves (GW) at nano-Hz frequencies, we consider the prospects of generating such a signal from inflationary blue-tilted tensor power spectrum in a specific dark matter (DM) scenario dubbed as Miracle-less WIMP. While Miracle-less WIMP, due to insufficient interaction rate with the Standard Model (SM) bath gets thermally overproduced, inflationary blue-tilted gravitational waves (BGW) in compliance with PTA data, conflict cosmological observations if reheat temperature after inflation is sufficiently high. Both these issues are circumvented with late entropy dilution, bringing DM abundance within observational limits and creating a doubly-peaked feature in the BGW spectrum consistent with cosmological observations. The blue-tilted tail of the low-frequency peak can fit NANOGrav 15 yr data, while other parts of the spectrum are within reach of present and future GW experiments.

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