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Detectability of Standing Accretion Shock Instability: New results with cWB XP

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Core-collapse supernovae are the most promising astrophysical sources of burst gravitational waves for current and next-generation interferometric detectors. In the post-bounce phase of CCSNe, the Standing Accretion Shock Instability (SASI) plays a crucial role in the explosion mechanism, generating distinctive, quasi-periodic gravitational wave signatures. Accurate detection and characterization of the SASI signal, especially its central frequency and duration, provide valuable insights into the dynamics of the stalled shock and the proto-neutron star. In this work, we advanced the methodology for identifying SASI signatures by leveraging a new configuration of the coherent WaveBurst pipeline, labeled XP, which employs the novel wavescan time-frequency transformation. We analyze likelihood maps from XP reconstructions of simulated CCSN gravitational wave signals embedded in LIGO O3 data using the SASImeter, a Python-based pipeline that isolates and characterizes SASI components. These results underscore the potential of upgraded analysis pipelines for extracting physical information from stochastic, transient gravitational wave signals of astrophysical origin.

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