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Prospects for detecting long-duration transient gravitational waves from glitching pulsars with current and future detectors

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Pulsars are rotating neutron stars that emit electromagnetic radiation. Even though pulsars slow down while they lose energy, they can suffer glitches: spontaneous increases of their rotational frequency. These glitches can also lead to the emission of long-duration transient gravitational waves (GWs). An increase in the sensitivity of GW detectors is indispensable for measuring new types of GWs. Existing ground-based detectors are currently being improved for the next observation run (O4) and a new generation of detectors will be built, like the Einstein Telescope, which will improve sensitivity by an order of magnitude and also open up lower frequencies for observation. We present detection prospects for long-duration transient gravitational waves from glitching pulsars by comparing data of known pulsars with the sensitivity of current and future GW detectors. We review methods to perform a post-glitch GW search, and reanalyze the ATNF pulsar catalog together with the ATNF and Jodrell glitch catalogs to extrapolate to the detectability of future glitches. In particular, we perform a specific prediction for Crab-like and Vela-like pulsars: from the setup of our O3 matched-filter analysis, we can determine a realistic sensitivity for future searches and comparing the maximum strain of an emitted GW with the expected sensitivity curve we can see how likely we are to detect long-duration transient GW signals from glitching pulsars in the future.

Which topic best fits your talk?

Modelling and Machine Learning Algorithms

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