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Hunting the oxymoron: transient continuous waves from disturbed neutron stars

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Disturbed neutron stars – soon after their birth, after a starquake or due to episodic accretion – could emit gravitational waves in the ground-based detector band, both in the form of initial bursts and as longer-lasting weak transients. Data analysis methods derived from the established search efforts for “continuous waves” are well suited for transient quasi-periodic signals with durations from hours to weeks. We discuss the application of such “transient continuous wave” search methods, focussing on two scenarios: targeted analysis of glitching pulsars known from electromagnetic observations, and the followup of outliers from all-sky continuous-wave searches which exhibit hints of transient behaviour. Based on mock data studies, we consider the sensitivities achievable with advanced LIGO, and the potential of transient detections – or upper limits – to study the structure of neutron stars and the physical mechanisms behind glitches.

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