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Projected Constraints on Scalarization with Gravitational Waves from Neutron Star Binaries LAURA SAMPSON, NICOLAS YUNES, NEIL CORNISH, Montana State University, MARCELO PONCE, University of Guelph, ENRICO BARAUSSE, Institut d'Astrophysique de Paris, ANTOINE KLEIN, University of Mississippi, CARLOS PALENZUELA, Canadian Institute for Theoretical Astrophysics, LUIS LEHNER, Perimeter Institute for Theoretical Physics — Certain scalar-tensor theories endow stars with scalar hair, sourced either by the star's own compactness, or by the companion's scalar charge, or by the orbital binding energy. Scalarized stars in binaries have different conservative dynamics than in General Relativity, and can excite a scalar mode in the metric perturbation that carries away dipolar radiation. As a result, the binary orbit shrinks faster than predicted in General Relativity, modifying the rate of decay of the orbital period. Scalar-tensor theories can pass existing binary pulsar tests, because observed pulsars may not be compact enough or sufficiently orbitally bound to activate scalarization. Gravitational waves emitted during the last stages of compact binary inspirals are thus ideal probes of scalarization effects. In the work presented here, we analyze the types of constraints the gravitational wave measurements from the advanced LIGO detectors will be able to place on these types of scalar-tensor theories.

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