Abstract Submitted
for the APR15 Meeting of
The American Physical Society

Projected Constraints on Lorentz-Violating Gravity with Gravitational Waves DEVIN HANSEN, NICOLAS YUNES, KENT YAGI, Montana State University — Gravitational waves are excellent tools to probe the foundations of General Relativity in the strongly dynamical and non-linear regime. In this talk I will consider one such foundation, Lorentz symmetry, which can be broken in the gravitational sector by the existence of a preferred time direction, and thus, a preferred frame at each spacetime point. This leads to a modification in the orbital decay rate of binary systems, and also in the generation and chirping of their associated gravitational waves. I will examine whether waves emitted in the late, quasi-circular inspiral of non-spinning, neutron star binaries can place competitive constraints a proxy of gravitational Lorentz-violation: Einstein-Æther theory. I will show that a gravitational wave detection consistent with General Relativity can only place competitive constraints on gravitational Lorentz violation when using future, third-generation or space-based instruments. I will also show that a single electromagnetic counterpart to a gravitational wave detection is enough to place constraints that are 10 orders of magnitude more stringent than current binary pulsar bounds, even when using second-generation detectors.

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Date submitted: 02 Jan 2015 Electronic form version 1.4