Horava gravity in the aftermath of LIGO: constraints and concerns

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Horava gravity is a candidate for a renormalizable gravity theory, founded on the idea of anisotropic scaling between time and space. It has a built-in preferred time direction, thus violates the local Lorentz symmetry. This allows the high energy theory to have more convergent behaviour compared to General Relativity (GR) without spoiling unitarity.

In the first part of the talk, I will give an overview of Horava gravity, summarizing various theoretical and observational constraints on the theory. In particular, the recent detection of binary neutron star merger GW170817 with coincident gamma ray emission provides a new perspective on the allowed parameter space of the theory, indirectly affecting the constraints from solar system tests.

The second part is devoted to a major obstacle for any gravity theory with high energy Lorentz violations, which is the restoration of Lorentz invariance at low energies in the matter sector. Even if the matter sector is Lorentz invariant at tree level, quantum corrections will cause a "leak" of Lorentz violations from gravity. Such effects in matter are constrained with very high accuracy. The leak can be suppressed naturally by new symmetries, strong dynamics or a scale hierarchy between gravity and Lorentz violations. I will discuss an application of the latter approach to Horava gravity.