Abstract of Talk by B. L. Hu at COST, Weizmann Institute, Israel, March 25, 2014

"**Problems of Newton-Schrodinger equations in Alternative Quantum Theories**"*

Abstract

Newton-Schr\"odinger Equations (NSEs) [1] are used in many alternative quantum theories [2]. We show that they do not follow from general relativity (GR) and quantum field theory (QFT) from two considerations:
1) Taking the nonrelativistic limit of the semiclassical Einstein equation, the central equation of relativistic semiclassical gravity, a fully covariant theory based on GR+QFT with self-consistent backreaction of quantum matter on the spacetime dynamics;
2) Working out a model [3] with a matter scalar field interacting with weak gravity, in procedures analogous to the derivation of the nonrelativistic limit of quantum electrodynamics. We conclude that the coupling of classical gravity with quantum matter can only be via mean fields, there are no N-particle NSEs and theories based on Newton-Schr\"odinger equations assume unknown physics.

*Based on C. Anastopoulos and B. L. Hu, **[**arXiv:1402.3813**]** and paper *in preparation*
[1] See, e.g., H. Yang et al, Phys. Rev. Lett. 110, 170401 (2013) and *references therein.*
[2] See, e.g., A. Bassi et al, Rev. Mod. Phys. 85, 471- 527 (2013) and *references therein.*
[3] C. Anastopoulos and B. L. Hu, Class. Quant. Grav. 30, 165007 (2013).