

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Experimental observation of melting of the effective Minkowski spacetime¹ IGOR SMOLYANINOV, University of Maryland, VERA SMOLYANINOVA, Towson University — Cobalt nanoparticle-based ferrofluid in the presence of an external magnetic field forms a self-assembled hyperbolic metamaterial, which may be described as an effective 3D Minkowski spacetime for extraordinary photons. Moreover, such extraordinary photons perceive thermal gradients in the ferrofluid as an effective gravitational field, which obeys the Newton law. If the magnetic field is not strong enough, the effective Minkowski spacetime gradually melts under the influence of thermal fluctuations. On the other hand, it may restore itself if the magnetic field is increased back to its original value. Here we present direct microscopic visualization of such a Minkowski spacetime melting/crystallization, which is somewhat similar to hypothesized formation of the Minkowski spacetime in loop quantum cosmology [1]. [1] M. Bojowald, J. Mielczarek, “Some implications of signature-change in cosmological models of loop quantum gravity”, arXiv:1503.09154 [gr-qc]

¹This work was supported in part by NSF grant DMR-1104676

Igor Smolyaninov
University of Maryland

Date submitted: 04 Nov 2015

Electronic form version 1.4