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Entanglement measures in massless Lifshitz field theory with arbitrary anisotropy

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We study salient information and correlation measures, namely, entanglement entropy, reflected entropy, Markov gap and timelike entanglement entropy in the 1+1D massless Lifshitz field theory that follows anisotropic scaling along temporal and spatial directions. We introduce a continuous family of Lifshitz scale invariant degenerate Rokhsar-Kivelson ground states for our chosen theory with any real arbitrary anisotropy index. By using the notion of fractional derivatives, we employ the associated kernels to study different entanglement measures for both adjacent and disjoint subsystems. Non-trivial dependencies of each of the measures on the arbitrary anisotropy are found. Based on our observations, we propose a holographically consistent 2+1D Lifshitz bulk with an anisotropy-dependent radius of curvature. Subsequently, we use the holographic picture to compute the timelike entanglement entropy for Lifshitz theories.

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