JOINT TUFTS/MIT COSMOLOGY SEMINAR

Measurement in Quantum Field Theory: measurement schemes, state updates, impossible measurements, and all that

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Many presentations of quantum mechanics include a postulate that the state of a system undergoes an instantaneous change following a measurement. This is clearly incompatible with special and general relativity and raises questions concerning the description of measurement in quantum field theory (QFT). Attempts to extend measurement postulates to QFT by hand have produced pathologies, such as the "impossible measurements" described long ago by Sorkin.

I will present a recent operational approach to these questions, which models measurement of one quantum field (the system) by coupling it to another (the probe). This is all accomplished in a model-independent way within algebraic quantum field theory (AQFT). The resulting framework provides a description of measurement in QFT that is causal, covariant and consistent, and includes state update rules that are derived from the formalism, and works equally well in flat or curved spacetimes. No prior knowledge of AQFT will be assumed.

Friday, March 22, 2024, 2:45 pm

574 Boston Ave, Room 206

Tufts University

Refreshments at 2:15 outside room 304