Measurement and preparation protocols for QFT on curved spacetimes

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I will review the framework for measurement in QFT introduced in joint work with Rainer Verch [1], which provides a covariant and consistent description of measurements and state updates and (as an application) resolves the "impossible measurement" problems raised by Sorkin long ago [2]. The framework is also known to be comprehensive in the sense that there are classes of QFTs for which all local observables can be obtained in an asymptotic sense from local measurement schemes [2]. I will describe work in progress (partly with Benito Juárez Aubry) that gives exact local measurement schemes for all observables, and also gives a preparation procedure for physical (i.e., Hadamard) local product states.

[1] Quantum fields and local measurements, CJ Fewster and R Verch, Commun. Math. Phys. 378 (2020) 851-889 arXiv:1810.06512

[2] Impossible measurements require impossible apparatus, H Bostelmann, CJ Fewster and MH Ruep, Phys. Rev. D 103 (2021) 025017 arXiv:2003.04660

[3] Asymptotic measurement schemes for every observable of a quantum field theory, CJ Fewster, I Jubb and MH Ruep, Annales Henri Poincaré 24 (2023) 1137–1184. arXiv:2203.09529