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Operator Algebra Perspective on Entanglement-Assisted Quantum Codes

The idea of using entanglement as a resource in quantum computing and communication has been around for a long time. Two decades ago, 'entanglement-assisted' quantum codes were introduced in quantum error correction (EAQEC) as a resource for boosting transmission rates when a sender and receiver share pre-existing entanglement. Shortly thereafter, a pair of (not so clearly related I'd say) generalizations of EAQEC were formulated for 'subsystem codes' and for the classical enhancement of quantum code transmission. As it turns out, each of these three types of code can be viewed as special cases of a general framework for EA codes built on an operator algebra approach to quantum error correction. In addition to unifying these code types under a single umbrella, the resulting framework (EAOAQEC) yields new types of EA codes. In this talk, I'll give a brief introduction to entanglement-assisted codes, the EAOAQEC framework, and some of our results (time dependent). This talk is based on joint work with Serge Adonsou, Guillaume Dauphinais, Priya Nadkarni, and Michael Vasmer.