Abstract. Exact stabilization of the multi-partite entangled GHZ state, by using fixed dissipation operators acting each on few local qubits only, has been shown to be impossible. However, a sequence of two such stabilization procedures does allow to converge towards the GHZ state. It is then tempting to propose an approximate stabilization of GHZ, where the sequence is applied in some kind of superposition. The present paper works out how this can be achieved. We examine several alternative ways to implement the classical synchronization which is necessary between the two stabilization procedures, thanks to a chain of “clock” ancillas or to additional levels on the data subsystems. All of them feature a design tradeoff between approximate stabilization fidelity and protection against errors. The methods are meant to illustrate how simple autonomous automata can be implemented for quantum stabilization.

This is joint work with Vincent Martin (inria PhD student until 2022).