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*Hybrid quantum memory and its capacity*

What is the most general possible kind of memory consistent with quantum mechanics? The only commonly considered kinds are qudits and classical digits, but a hybrid modelled by an arbitrary  $C^*$ -algebra is more generally possible. The important Choi–Effros theorem implies that it is the most general possible quantum memory model modulo certain (debatable) assumptions. In particular it generalizes the theory of “decoherence-free subspaces”.

Assuming this model, when is one hybrid memory worth more than another? I will give a characterization of when many copies of a memory  $A$  embed (or blindly encode with perfect fidelity) into slightly more copies of another memory  $B$ . In particular, either there is such an embedding, or  $A$  admits a state that does not visibly encode into  $B$  with high fidelity. The second half of this alternative depends on a Holder inequality for hybrid memories that generalizes the classical pigeonhole principle.

Reference: [quant-ph/0203105](#).