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Entanglement breaking rank

A quantum channel is entanglement breaking if and only if it admits a Choi-Kraus representation consisting of rank-one Choi-Kraus operators. We define the entanglement breaking rank of an entanglement breaking channel to be the least number of such rank-one operators required in its Choi-Kraus representation. We show that the problem of computing the entanglement breaking of the channel:

$$X \mapsto \frac{1}{d+1}(X + \mathsf{Tr}(X)I_d),$$

is equivalent to the existence problem of SIC POVM in dimension d.