Process reconstruction: From unphysical to physical maps via maximum likelihood

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Abstract. We show that the method of maximum likelihood (MML) provides us with an efficient scheme for reconstruction of quantum channels from incomplete measurement data. By construction this scheme always results in estimations of channels that are completely positive. Using this property we use the MML for a derivation of physical approximations of un-physical operations. In particular, we analyze the optimal approximation of the universal NOT gate as well as a physical approximation of a quantum nonlinear polarization rotation.

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