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Sufficiency and reversibility in von Neumann algebras:
Petz' work revisited

### Abstract

For 1986–2006 D. Petz wrote several papers on the sufficiency of subalgebras and the reversibility of quantum channels for normal states in the general von Neumann algebra setting. In those papers he characterized the reversibility of a 2-positive unital map $\alpha : N \to M$ between von Neumann algebras for normal states $\varphi, \omega$ on $M$ in terms of the equalities $D(\varphi \circ \alpha \| \omega \circ \alpha) = D(\varphi \| \omega)$ for relative entropy and $P(\varphi \circ \alpha, \omega \circ \alpha) = P(\varphi, \omega)$ for transition probability. In my talk I revisit Petz' work and extend his results to those in terms of the equality $S_f(\varphi \circ \alpha \| \omega \circ \alpha) = S(\varphi \| \omega)$ for standard $f$-divergences.