

Quantum channel capacities – some answer and many questions

Andreas Winter^{1 2 *}

¹*ICREA & Física Teòrica: Informació i Fenòmens Quàntics,
Universitat Autònoma de Barcelona, ES-08193 Bellaterra (Barcelona), Spain*

²*Department of Mathematics, University of Bristol, Bristol BS8 1TW, UK*

Abstract. I will give an overview on the current state of knowledge on communication via quantum channels. In this subject, the fundamental question is that of the capacity of a given channel, when used in a memoryless fashion asymptotically many times. It is well-known nowadays that quantum channels, unlike their classical counterparts, are not characterized by a single capacity number, but instead give rise to a veritable “zoo” of capacities.

My intention in this tutorial is to describe recent progress and major challenges in the theory of quantum channel capacities, using roughly two thirds of the allotted time; in the remaining third I will take questions from the audience on the broad topic of the tutorial, and answer them on the board.

Keywords: Quantum Shannon theory, channels, capacities

References

- [1] C. H. Bennett and P. W. Shor. Quantum Information Theory. *IEEE Trans. Inf. Theory*, 44(6):2724–2742, 1998.
- [2] A. S. Holevo. The capacity of quantum channel with general signal states. *IEEE Trans. Inf. Theory*, 44(1):269–273, 1998.
- [3] M. M. Wilde. *Quantum Information Theory*. Cambridge University Press, 2013.
- [4] M. M. Wolf. Quantum Channels & Operations – Guided Tour. <http://www-m5.ma.tum.de/foswiki/pub/M5/Allgemeines/MichaelWolf/QChannelLecture.pdf>, 2012.

*andreas.winter@uab.cat