

io-port 06031188**Belavkin, Viacheslav P.****New types of quantum entropies and additive information capacities.**

Accardi, Luigi (ed.) et al., Quantum bio-informatics IV. From quantum information to bio-informatics, Tokyo, Japan, March 10–13, 2010. Selected papers based on the presentations at the international conference. Hackensack, NJ: World Scientific (ISBN 978-981-4343-75-6/hbk; 978-981-4343-76-3/ebook). QP-PQ: Quantum Probability and White Noise Analysis 28, 61-89 (2011).

An elementary algebraic approach to unified quantum information theory is given. An operational meaning of entanglement as specifically quantum encoding is disclosed. The general relative entropy as information divergence is introduced and three most important types of relative information, namely, Araki-Umegaki (A-type) and of Belavkin-Staszewski (B-type) and the thermodynamical (C-type) are described. The true quantum entropy different from the von Neumann semiclassical entropy is introduced and the proper quantum conditional entropy is proposed. The general quantum mutual information via entanglement is defined and the corresponding types of quantum channel capacities as the supremum via the generalized encodings are formulated. The additivity problem for quantum logarithmic capacities for the products of arbitrary quantum channels under the appropriate constraints on encodings is discussed. It is proved that the true quantum capacity, which is achieved on the standard entanglement as the optimal quantum encoding, reclaims the additivity property of the logarithmic quantum channel capacities via the entanglement on the products of quantum input states. This earlier obtained by V. P. B. result for quantum logarithmic information of A-type is extended to any type of quantum information. The paper is organized as follows: section two introduces related notions of quantum probability and information theory, such as quantum state and quantum entanglement; section three introduces the general quantum divergence and new types of quantum relative entropies via the divergence; section four introduces the entangled quantum mutual information and the true quantum entropies of three types achieved via entanglement; section five introduces quantum channel capacity via entanglement encoding and shows additivity of the logarithmic entangled quantum channel capacity of any type; the final section contributes to conclusion and further problems.

Vladislav Nikolaevich Dumachev (Voronezh)

Keywords: quantum channel capacities; quantum divergence; mutual information
<http://ebooks.worldscinet.com/ISBN/9789814343763/9789814343763.0006.html>