Quantum Physics

Private quantum decoupling and secure disposal of information

Francesco Buscemi

(Submitted on 28 Jan 2009 (v1), last revised 3 Dec 2009 (this version, v5))

Given a bipartite system, correlations between its subsystems can be understood as information that each one carries about the other. In order to give a model-independent description of secure information disposal, we propose the paradigm of private quantum decoupling, corresponding to locally reducing correlations in a given bipartite quantum state without transferring them to the environment. In this framework, the concept of private local randomness naturally arises as a resource, and total correlations get divided into eliminable and ineliminable ones. We prove upper and lower bounds on the amount of ineliminable correlations present in an arbitrary bipartite state, and show that, in tripartite pure states, ineliminable correlations satisfy a monogamy constraint, making apparent their quantum nature. A relation with entanglement theory is provided by showing that ineliminable correlations constitute an entanglement parameter. In the limit of infinitely many copies of the initial state provided, we compute the regularized ineliminable correlations to be measured by the coherent information, which is thus equipped with a new operational interpretation. In particular, our results imply that two subsystems can be privately decoupled if their joint state is separable.

Comments:	Child of 0807.3594 v2: minor changes v3: presentation improved, one figure added v4: extended version with a lot of discussions and examples v5: published version
Subjects:	**Quantum Physics (quant-ph)**
Journal reference:	New Journal of Physics 11 (2009) 123002 (17pp)
DOI:	10.1088/1367-2630/11/12/123002
Cite as:	**arXiv:0901.4506v5 [quant-ph]**

Submission history

From: Francesco Buscemi Dr [view email]
[v1] Wed, 28 Jan 2009 17:18:07 GMT (11kb)
[v2] Thu, 29 Jan 2009 19:17:34 GMT (11kb)
[v3] Thu, 30 Apr 2009 16:00:55 GMT (63kb,D)
[v4] Tue, 4 Aug 2009 13:05:37 GMT (73kb,D)
[v5] Thu, 3 Dec 2009 01:26:24 GMT (73kb,D)