



A Generalized Poor-Verdu Error Bound for Multihypothesis Testing and the Channel Reliability Function

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(Submitted on 18 Jul 2011)

A lower bound on the minimum error probability for multihypothesis testing is established. The bound, which is expressed in terms of the cumulative distribution function of the tilted posterior hypothesis distribution given the observation with tilting parameter θ larger than or equal to 1, generalizes an earlier bound due to Poor and Verdú (1995). A sufficient condition is established under which the new bound (minus a multiplicative factor) provides the exact error probability in the limit of θ going to infinity. Examples illustrating the new bound are also provided.

The application of this generalized Poor-Verdu bound to the channel reliability function is next carried out, resulting in two information-spectrum upper bounds. It is observed that, for a class of channels including the finite-input memoryless Gaussian channel, one of the bounds is tight and gives a multi-letter asymptotic expression for the reliability function, albeit its determination or calculation in single-letter form remains an open challenging problem. Numerical examples regarding the other bound are finally presented.

Comments: Parts of this technical report will appear in the IEEE Transactions on Information Theory

Subjects: **Information Theory (cs.IT)**

Cite as: [arXiv:1107.3474](https://arxiv.org/abs/1107.3474) [cs.IT]
(or [arXiv:1107.3474v1](https://arxiv.org/abs/1107.3474v1) [cs.IT] for this version)

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[v1] Mon, 18 Jul 2011 15:26:08 GMT (100kb)

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