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Two-party information splitting[1] PATRICK COLES, LI YU, VLAD GHEORGHIU, ROBERT GRIFFITHS, Department of Physics, Carnegie Mellon University — Consider the very general process where the state of a quantum system is encoded into a (possibly larger) quantum system, which is then physically split into pieces A and B. One can ask: how much information does A have (about the original state), how much does B have, and how are they related? We find a deterministic trade-off between the quantum information in A and that in B. One can go a step further and consider different types of information (e.g. the X, Y, and Z components of angular momentum), asking how much each party has of each information type. While classical information can be copied to both A and B, we find a trade-off inequality for an information type in A and a mutually-unbiased type in B, e.g. $I(X, A) + I(Z, B) \leq 1$ for X-information in A and Z-information in B. Even more intriguing is our finding that, for certain information measures, the information splitting between A and B, $I(W, A) - I(W, B)$, is invariant to the information type W. The fundamental phenomena of measurement and decoherence can be viewed as information splitting processes between the system and the apparatus (or environment), so our results are applicable to these phenomena.

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