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# Relative entropies as potential functions of quantum metrics: The q- z family

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The so-called q-z-Rényi Relative Entropies provide huge two parameters family of relative entropies which include almost all well-known examples of quantum relative entropies for suitable values of the parameters. In this talk we consider a log-regularized version of this family and use it as a family of potential functions to generate covariant (0,2) symmetric tensors on the space of invertible quantum states in finite dimensions. The geometric formalism developed allows us to obtain the explicit expressions of such tensor fields in terms of a basis of globally defined differential forms on a suitable unfolding space without the need to introduce a specific set of coordinates. We first limit the exposition to the qubit case, and then, we extend the results to a generic n-level system. By suitably varying the parameters q and z, we are able to recover well-known examples of quantum metric tensors that, in our treatment, appear written in terms of globally defined geometrical objects that do not depend on the coordinates system used. In particular, we obtain a coordinate-free expression for the von Neumann-Umegaki metric, for the Bures metric and for the Wigner-Yanase metric in the arbitrary n-level case.

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