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Quantifying the quantum correlations in light-harvesting complexes SAI VINJANAMPATHY, Department of Physics and Astronomy, Louisiana State University, KAMIL BRADLER, MARK WILDE, School of Computer Science, McGill University, Montreal, Quebec, Canada., DIMITRI USKOV, Department of Physics and Engineering Physics, Tulane University — Biological systems have been of recent interest for the role that quantum correlations may play for functionality or in evolution. One such biological phenomenon under study is the photosynthesis of certain organisms, for instance low light adapted green sulfur bacteria. The Fenna-Matthews-Olson (FMO) protein complex is a biological light harvesting complex that is found in such systems. It has drawn considerable attention as a template to understand the role of quantum correlations. Many measures exist that can be employed to characterize quantum correlations. One such measure, quantum discord, captures all non-classical correlations that are present in the system. Since discord may be robust against various models of decoherence, there is further interest in understanding whether there is quantum discord present in the FMO complex. The first picosecond is relevant for the transfer of excitation. We study many related measures of quantum correlations such as quantum discord, mutual information and relative entropy of entanglement to understand the nature of correlations and the timescales over which they persist in the FMO complex.

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