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Entanglement and Non-Classical Correlations in Light-Harvesting Complexes DMITRY USKOV, Physics Department, Tulane Universty, KAMIL BRADLER, MARK WILDE, School of Computer Science, McGill University, Montreal, Quebec, Canada, SAI VINJANAMPATHY, Physics Department, Louisiana State University — This work belongs to the emerging field of quantum biology. The main direction of research in the quantum biological program is to identify and quantify the role of "quantumness" in basic biological processes, exploiting appropriate tools of quantum information theory. Using the tight-binding Hamiltonian and the Lindblad form of master equations, we calculate the time evolution of the density matrix of an exciton in the Fenna-Matthews-Olson (FMO) protein complex during the energy transfer from an antenna to a reaction center at cryogenic T=77°K and physiological T=300°K temperatures. The quantum information toolbox is then applied to analyze the resulting density matrix. We compute *quantum discord functional* to identify the amount of non-classical quantum correlations and compare the result with *relative entropy of entanglement*. We observe an interesting phenomenon that the value of discord is typically one order of magnitude larger than the value of relative entropy of entanglement, indicating that non-classical correlations may be more robust against phase decoherence than the quantum entanglement.

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